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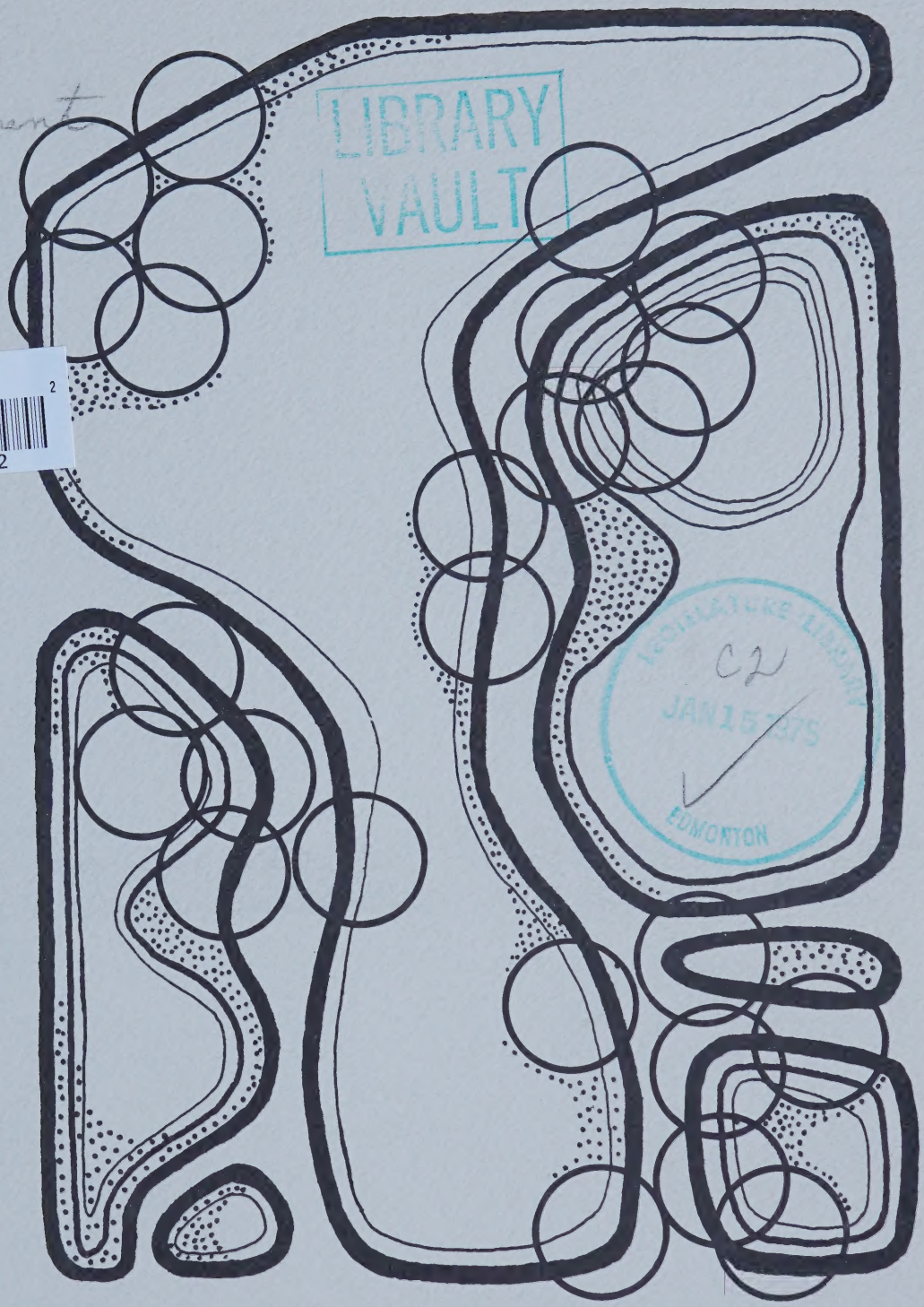

THE BOW RIVER IMPACT STUDY

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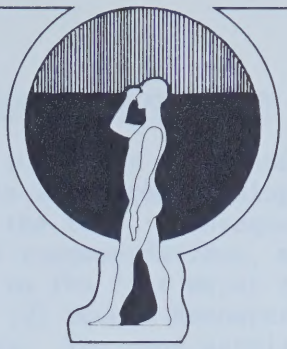
Lombard North Group



September 17, 1973.

Bow River Study Committee

Gentlemen:

Whereas the Minister of the Environment commissioned The Lombard North Group Ltd., to conduct the Bow River Impact Study and established the Bow River Study Committee to act as a steering committee for the study, we are pleased to submit this report titled "Bow River Impact Study". The main objective of this study was to identify social, visual, recreational and biological impacts related to the recommendations contained in the report titled "City of Calgary Flood Study", Volume 1, Bow River Report by Montreal Engineering Limited.

Many individuals, organizations and government agencies participated in this study and we would like to acknowledge their extensive contributions in the form of council, guidance and constructive criticism. We would also like to thank the public at large for their interest, enthusiasm and co-operation. They have contributed significantly to the public participation process and we look forward to their continued support at the Public Hearings to be held on the 12th and 13th of October.

Respectfully submitted,

THE LOMBARD NORTH GROUP LTD.

James Taylor

James R. Taylor,
Vice President & General Manager.

JRT:nb
Attach.

Address: The Penthouse, 1135-17th. Ave. S.W., Calgary, Alberta. T2T 0B6 Phone – (403) 244-8901.

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REPORT ORGANIZATION

The report is divided into four parts and has been organized to afford the reader an opportunity to study the findings and recommendations without having to read the body of the text. Consequently, Part 1 includes a general summary of the findings and recommendations, and the specific conclusions and recommendations pertaining to the four major topics covered in the study, namely: (1) Community Development, (2) Scenic Resources, (3) Recreational Resources,and (4) Plants, Animals and Fish. The same detailed recommendations are also located in the body of the text (Part 3) at the end of Sections 2 to 5 which are titled: (2) Communities and New Development - An Impact Assessment by Communities, (3) A Visual Analysis and Impact Assessment, (4) A Recreational Analysis and Impact Assessment, and (5) A Biological Analysis and Impact Assessment.

Part 2 provides important background information. It includes subjects such as, events leading to the study, how the study was conducted, some of the ground rules for assessing impacts, and the main findings and recommendations of the Montreal Engineering Report.

Part 3 provides an inventory and impact assessment of the four major topics considered in the report and previously identified. In addition to, the detailed conclusions and recommendations, Part 3, includes discussions specifically related to each of the communities affected by the Montreal Engineering Report.

Part 4 describes the results of the public involvement program and summarizes the responses generated at the public meetings.

The Appendix includes some of the more detailed biological information and a list of the communities, organizations, and individuals contacted during the course of the study.

The Bibliography provides a list of the documents used as background references for the study.

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A SUMMARY OF MAJOR CONCLUSIONS AND RECOMMENDATIONS

PART 1

The following comments comprise a summary of the findings and recommendations of the Bow River Impact Study. Detailed recommendations and conclusions with respect to each study topic are presented both in the text following this summary and in the text dealing with each study topic.

A. GENERAL SUMMARY

1. The recommendations presented by the Montreal Engineering report have implications ranging from the general to the specific. Accordingly, the assessment of impacts varies in kind and degree. Separate study criteria and intensities of investigation were applied to each study topic - community development, visual resources, recreational resources and biological resources. The findings and recommendations of the study correspondingly reflect a framework that relates to the points of reference and the base of information that was available.

2. The concept of a two district land use plan in flood-prone lands, the floodway and flood plain districts, allows for a rational meeting of private and public objectives in the development and organization of areas that are subject to flooding. The extent of the floodway district has been kept at a minimum so that compatible land development could be accommodated while still allowing for the provision of public open space and a freer passage of flood waters. The land use regulation indicated in the Montreal Engineering report tend to guide rather than impose restrictions on flood plain development. The objectives of the measure is to reduce the potential loss of life, property damage, etc., in the future, and to ensure that costs for such flood protection are borne by the beneficiaries rather than by the public at large.

3. It is recommended that the proposed engineering works (both immediate and future) entail:

   (a) Specific and detailed site inventories covering social, biological, visual, recreational and functional site planning concerns;

   (b) The development of alternative site planning and site management studies that allow for a proper evaluation of the "least impact" solution;

   (c) The incorporation of this solution into the project contract;

   (d) The inclusion of the works contract specifications of measures designed to reduce adverse impacts during the project construction phase.

4. The effects on the community of the flood study proposal that involve engineering works, a flood forecasting centre and the public information programme, are minor in comparison to those of the flood plain land use management programme. The overall community benefits of adopting a flood control programme based on flood plain management for the most part outweigh the negative impacts. Flood protection

is provided in the long run at minimal expense to the public. Potential increase in river access in currently undeveloped areas and a reduction in potential damage estimates are long term gains which would benefit the city as a whole.

Flood plain management should have little or no adverse impact on the majority of existing communities. Assuming the application of the land use regulations will not be retroactive, property values may temporarily decrease only to soon recover and stabilize.

Because of increased development costs, it is anticipated that there will be a general overall trend to higher land use densities in the flood plain.

Some communities which lie in the flood plain are located there because of lower costs associated with occupying flood-prone land (i.e. apart from historical occupancy). Such communities (eg., the Chinese community, Inglewood and to a lesser degree Hillhurst-Sunnyside) may be adversely affected because strict application of the plan could demand fragmented land uses thereby disrupting the existing community structure.

It may be necessary that the specific application of flood plain proposals to these communities be re-examined in light of community needs.

5. The proposed engineering works, and any future engineering works, involving the river should, if implemented, not be allowed to restrict the potential use and enjoyment of the river by the public. They should rather be employed to retain as much as possible, the visual quality of riverbank lands, the identity of the visual character/activity zones of the river, and the potential for recreational access to, along, and across the river.

6. The two district flood management schemes does not solve the critical issue related to the establishment of recreational and natural areas, and the system linking these areas. The fact that the city's recreational plan is mainly conceptual, made an assessment potential impacts difficult and further complicated recommendations pertaining to future courses of action. Until all the major recreation sites and natural areas have been identified, and the needs for them recognized with respect to a comprehensive framework, implementation of the non-specific engineering works (e.g., clearing, dredging, etc.) will continue to threaten the quality of the existing base conditions for maximizing developmental opportunities.

7. The natural features of the study area comprise the riverine ecosystem made up of two principal biological systems - the Bow River and a variety of land based vegetational stands which, for the most part, are native and wild. Correspondingly a wild complex of animals inhabit these systems. The Bow River fishery is highly rated. There will be some unquantified losses in its capability primarily due to proposed

engineering works. Natural vegetation features could be subject to serious disruption with resulting losses in wildlife capability and bases for recreational use and aesthetic appreciation. Some of these losses could be mitigated by modifying the flood management plan, by landscaping inputs, or by implementing other provisions to preserve selected natural features.

B. DETAILED CONCLUSIONS AND RECOMMENDATIONS BY STUDY TOPIC

1. COMMUNITY DEVELOPMENT

(a) The proposed flood plain management plan provides no immediate flood protection to communities currently existing within the flood plain. It does, however, offer both protection and a reduction in potential property damage over time as a direct result of redevelopment to meet flood plain specifications.

(b) While property values may intially decrease in some communities upon public identification of the flood threat, the implementation of flood plain management is not likely to have significant long term adverst effects.

Five pieces of private property in Bowbank Crescent are recommended for removal from the proposed floodway zone. Owners should be compensated for any loss by the purchase of the property at fair market value.

(c) In the absence of a definite proposal for the provision of public access to riverbank areas, the adoption of flood plain management does not inherently permit public access to the river in existing communities. However, the potential for river banks access is increased in undeveloped portions of the city and measures should be employed to ensure this access.

(d) The adoption of flood plain management will result in increased construction costs due to special building standards, for any future development occuring within flood plain communities.

Future development would logically tend toward medium to high density structures or toward large scale projects where this increased cost may be minimized. Future development would appear to be less likely in low lying, economically depressed communities.

(e) The impact of adopting flood plain management upon the structure of existing communities will vary across the city. Those with the lowest economic base also have the largest percentage of the community, as a whole, lying within the flood plain. The potential impact would appear to be most severe for Inglewood and Chinatown. Some adverse impacts can also be anticipated for Hillhurst-Sunnnyside and Bridgeland.

Consequently, there is a definite need to re-examine the flood plain management proposals in terms of their applicability to these communities given the objectives of the community and their ability to realize these objectives. Dyking in the Inglewood area may, for example, be a more practicable local solution which would still allow development if proceeded in accordance with established plans.

(f) The drafting of any by-law to regulate flood plain construction should recognize the individual property owner's need and ability to undertake improvements or renovations of existing structures in harmony with the normal maintenance life of the building.

(g) There is a need to establish a public information programme to explain in detail the flood plain management building regulations and their implications as expressed in by-law form.

(h) In order to preserve the social fabric of existing communities, it is recommended that a re-examination of community institutions in the flood plain be undertaken on an individual basis to determine how they may safely and economically exist in compliance with flood plain management objectives.

2. SCENIC RESOURCES

The character and clarity of the visual zones of the Bow River through Calgary as outlined in the beginning of this section should be preserved and enhanced. This should be accomplished through the maintenance of the positive elements such as vegetation, natural escarpments, and development reflecting appropriate relationships to the river, and through the rehabilitation of unsightly areas and eyesores. The recommended programme of limited engineering works and flood plain management should be used as the framework for the overall management of the visual resources of the Bow River.

Development guidelines should be effected requiring the establishment or preservation, and the maintenance of vegetated areas with screening of unsightly private development from the river in all areas. In the natural image areas, upstream from the Crowchild Bridge and downstream from the C.N.R. Bridge all development should be screened from the river except for isolated farm structures which would be appropriate to a pastoral character.

(a) VEGETATION REMOVAL

In general, the greatest impact on the visual and recreational resources would be in the area of vegetation removal, both that necessitated by the specific engineering works and that practiced as a part of the flood plain management programme - the "selective removal of vegetation" from the floodway.

No vegetation which is vital to the visual character of the river should be removed unless specific plans are presented for its removal and replacement. Such vegetation becomes critical in areas in which it is the only green relief to an otherwise artificial scene (such as at the Crowchild Bridge) and also in most park areas, where a natural image is desired (such as the Pearce Estate and Montgomery Flats areas).

Also, vegetation in some areas has an important role in screening unsightly elements from the river, or from the opposite bank. Clarification should be obtained as to the policy on the replacement of vegetation, or the addition to it, in the floodway in areas where the existing vegetation is insufficient or where its useful life is near an end.

Site plans establishing planting and other landscaping must be established concurrently with the detailed design of the engineering works. Furthermore, the specifications for the landscaping and, equally important, the continued maintenance of the landscaping should be written into the original contract for the proposed engineering works. Otherwise, such work is too easily put off, as is evidenced by the Crematorium Hill project. Furthermore, without continued maintenance, the landscaping might not establish itself sufficiently well on the banks and would likely be washed away with each high water, with little likelihood of being replaced.

Where exposed rip rap cannot be avoided, it should be of good visual quality subject to the approval of a landscape architect.

For such visually dominant features as escarpments, natural rather than exotic, vegetation should be retained or re-established, not only to pressure a natural image for these features and thus providing a contrast to the urban image of the City, but also for reasons of economy and safety. It would be difficult, often impossible, to establish or maintain manicured lawns on the escarpments, and the irrigation required would cause slipage. Natural prairie grasses should not present such a problem.

(b) PUBLIC LAND USE IN THE FLOOD PLAIN

The City and the Province should dedicate all undeveloped public land in the flood plain, especially in the floodway, as parkland and establish specific plans for its preservation as natural area.

It is declared objective of the City in the 1973 Calgary Plan to: "develop the river valleys as an open space system which includes:

(i) Continuous public access to all river banks at all times and public footpaths throughout the City.

(ii) Good recreational facilities in appropriate locations.

(iii) Protection from air, water, and visual pollution".

However, the allegations of some groups that the City intends to use riverbank lands for such inappropriate uses as structures

and roadways, have some credance, as in the case of the electrical substation recently constructed in the Crowchild Bridge area. Much of the public land is, at present, amongst the most unattractive and poorly maintained on the river.

(c) PRIVATE LAND USE IN THE FLOOD PLAIN

In keeping with the above stated City objective to "develop the river valleys as an open space system...", such visually-disruptive uses as gravel mining should be discontinued in the flood plain as well as in the floodway (the latter having been recommended by Montreal Engineering). Furthermore, areas already disturbed should be rehabilitated through a restoration of natural appearing contours and a programme of replanting.

3. RECREATIONAL RESOURCES

(a) An overiding policy is required that gives priority position to the recreational resources of the Bow River Valley in Calgary. This measure could still permit application of the flood management land use districts and could be implemented as follows:

(i) The city and the province should dedicate all undeveloped public land in the flood plain, especially in the floodway, as parkland (as mentioned in the Visual Resource section). This would eliminate the current system whereby the City Parks and Recreation Department must attempt to out-bid private developers to obtain public river valley land from the City Land Department.

(ii) The City should place a high priority in implementing its proposal for developing "the river valleys as an open space system".

(iii) Parks with a substantial portion of their areas in the floodway zone should be managed as natural areas, becasue of the prohibition against the construction of structures in this zone.

(iv) Wholesale vegeation removal in the floodway should not become a component of the programme. Any limited removal which is imperative for the maintenance of the public safety, should be shown clearly in a plan and then be subject to the review and approval of the City Department of Parks and Recreation (see Visual Resources section for related further recommendations).

(v) A variety of park types, from natural areas to manicured urban parks, should be created and maintained by the preservation of existing natural areas and the rehabilitation of presently disturbed areas within the flood plain, such as the gravel mining areas in the southeast. This policy could be utilized to strengthen the identity of the different zones along the river.

The preservation of existing vegetation will be essential to the former, as the possibility of the addition of new vegetation will be essential to the ladder.

(vi) Detailed plans for all engineering works on the river, including bridges, should incorporate non-vehicular pathways as well as landscaping (see also Visual Resources section). These projects, if they must be implemented, should increase rather than reduce public access to the river and the linkage of existing parks.

4. PLANTS, ANIMALS AND FISH

A presumed predication for evaluating the impact of the proposed flood management plan is that the plants, animals and fish are of value to the City of Calgary and the people of Alberta, and, that there should be some measure of how this value will be affected. It is further presumed that the effects would be appraised relative to all needs and weighed against the advantages or disadvantages of implementing a flood control plan for the sole purpose of property protection. The flood management plan will reduce the quality of the natural systems. There would be a significant depreciation in conditions that otherwise comprise a base for wilderness in an urban setting along with attendant recreational uses and aesthetic appreciation. A judgement therefore is required on the significance of this loss and whether or not it can be reconciled with advantages gained elsewhere by incurring the loss. At the same time there is the opportunity to reduce these losses through modifying the flood plan and by mitigating some of the unavoidable losses. These ameliorative measures are presented in the following recommendations:

(a) Re-establish the boundary delineation of the Floodway zone so that select natural areas can be included in its jurisdiction thereby affording them increased chances of preservation; this action would not be necessary if the city were to afford these areas special protection. Class 1, 2 and 3 "natural areas" have the highest relative values and they at least should be protected.

(b) In all cases keep vegetation removal down to an absolute minimum.

(c) Re-examine the need to remove shrubs and trees under 20 feet in height in the Floodway District and shrubs and dead trees in the Flood Plain District.

(d) Mitigate for vegetational and habitat losses through landscaping intact sites with the objective of either upgrading them or managing them to replicate habitats that are lost.

(e) Keep all proposed physical disturbance and disruption of the river channel at a minimum.

(f) Consider the use of abandoned flooded gravel pits in the river flats as managed put-and-take sport fisheries. This measure could partly mitigate the anticipated loss in the sport fishery of the Bow River.

(g) Examine the relationship between Flood Plain natural areas and natural areas beyond the Flood Plain prior to the ultimate determination of natural area boundaries.

(h) Prior to implementing future engineering measures, a supervisory body of natural scientists should be established. The role of this body would be to ensure that the impact would be minimized during the construction phase through adherence to environmental protection specifications.

PART 2. A STUDY OVERVIEW

A. BACKGROUND AND INTRODUCTION

1. Events Leading to the Bow River Study

2. Organization and Participation

3. Study Procedure

4. Terms of Reference

B. OBJECTIVES: THE BOW RIVER IN CALGARY

C. THE ESSENCE OF THE BOW RIVER FLOOD STUDY REPORT

A STUDY OVERVIEW

PART 2

A STUDY OVERVIEW

A. BACKGROUND AND INTRODUCTION

1. EVENTS LEADING TO THE BOW RIVER FLOOD STUDY

Flooding of the Bow River has been a problem since the founding of Fort Calgary. In response to requests from the Alberta Department of the Environment and the City of Calgary, Montreal Engineering Company Limited, has over the past several years, studied the flooding problem in Calgary and presented its recommendations in a series of reports.

The latest and most comprehensive of these was the City of Calgary Flood Study, Volume One, Bow River Report. While this report was in preparation, the city proceeded with two of the recommended measures: The Crematorium Hill stabilization and the channel alternations in the St. George's Island area. The former was carried out without incident, but the latter met with resistance.

City Council had authorized channelling of the river near the island to permit building expansion by the Calgary Zoo on the island. Such expansion would make the control of flooding in the vicinity of the Zoo imperative. However, this involved the removal of some trees in the area. Public opposition resulted in this operation ceasing. Following this, the Bow River Study Committee was formed to examine the proposed flood programme and hold public hearings.

2. ORGANIZATION AND PARTICIPANTS

The Bow River Study Committee is comprised of W. Solodzuk, R. Bailey and E. Kupchanko, representing the Province of Alberta and H. Riley, W. Perks, and G. Steber representing the City of Calgary. The committee is responsible for examining the proposed flood control programme and holding public hearings on the subject.

The Lombard North Group Ltd., an environmental planning and resource development consulting firm was retained to carry out an environmental impact assessment on the proposed flood control works and flood plain management programme for the Bow River with the City of Calgary.

3. STUDY PROCEDURE

During the summer of 1973, a team of the Lombard North Group comprised of biologists, landscape architects, environmental planners and community workers, organized and conducted the study. Besides utilizing its own internal capabilities, the Lombard North Group enlisted the aid of communities that would be affected by the proposed programme, as well as other interested groups and individuals. Through public presentations and publications, the public was informed of the state of the river corridor at present, the nature of the proposals and their probable impacts if implemented. Public response in the form of concerns, expressed needs and suggestions are presently being gathered. In addition, after the release and review of this report, public hearings will be held to allow for a formal presentation of these public attitudes.

4. TERMS OF REFERENCE

Primary Objective: To assess the environmental and sociological impact of flood management recommendations for the flood plain of the Bow River within the City of Calgary as contained in the study entitled "City of Calgary Flood Study, Volume I, Bow River Report", by Montreal Engineering Company Limited.

Ancillary Objectives:

1. The consultant will assimilate "Summary Reports" suitable for distribution and presentation to, and discussion with the public in respect of:

   (a) the natural resources capability of the Bow River and Flood Plain area, using such base line data as is available from the Provincial Government, various published reports, and private associations, supplemented by such field work as is feasible and appropriate to make an evaluation of the sensitivity of these resources to the engineering projects recommended by Montreal Engineering Company Limited.

   (b) The recreational and aesthetic resources of the Bow River and flood plain area.

   (c) A condensed and simplified version of the report entitled "City of Calgary Flood Study, Volume I, Bow River Report".

   (d) Other related information from previous reports and through discussion with provincial authorities and agencies.

2. Through presentation of the summary reports to the communities which would be directly affected by the flood management recommendations, including special interest groups such as industry in the flood plain area, conservation groups, the City of Calgary, and various community organizations.

3. Upon completion of the summary reports and their presentation, the consultant will prepare a preliminary evaluation of the environmental, ecological, economic and sociological consequences of the flood management proposals in a form or forms suitable for graphic presentation to meetings of the general public, for distribution to individuals or groups, and for release through the various types of communication media and thereafter endeavour to fully evaluate the public response to the flood management proposals.

4. The consultants will, on or before, October 1, 1973, prepare an impact statement based upon clauses (1) through (3) together with an outline of alternative solutions which have been proposed as a result of public participation in the planning process.

5. The consultants will present the Impact Statement at Public Hearings to be arranged by the Bow River Study Committee during October, 1973.

B. THE OBJECTIVES FOR THE BOW RIVER IN THE CITY OF CALGARY

A river is a community; a community of fish, aquatic and terrestrial plants and wildlife. The geological landscape, climate and other factors serve to establish the relationship between these communities and, in turn, establish the character of that river. Within the length of a river from water source to its mouth, the various elements of these communities, changes in soil and geology, and changes in local climate, create a variety of local characteristics. The river is a dynamic community: A change in one area may result in changes in an adjacent area.

The river community is an attractive force on man. Man builds beside the river for water, transportation, beauty, and recreation pursuit. His actions change that river community and character. As the amount of man's actions and development increase by that river, so do his potential impacts on that river and its life.

Correspondingly, a river is "designed" by natural forces over a period of time to carry a certain amount of water. In times of excessive moisture, the river may flood. In doing so, it can destroy the activities and developments of man. Clearly therefore, if both the active communities of man and river are to successfully co-exist, man must establish his objectives as an individual and as a community in relationship to that river.

In earlier studies regarding the relationship between the people of Calgary and the Bow River, the Mawson Plan, prepared in 1812 for the City Planning Commission, noted that "...along your two rivers, the Bow and the Elbow, there are numberless beauty spots, and even where these do not exist, or have been somewhat destroyed by the type of development allowed along their banks, there is no doubt that they can be restored to a type of beauty more suited to their urban surroundings, and at comparatively little expense. Another advantage that seems never to have been realized by the people living in Calgary..."

There is, however, a change underway in these attitudes. This is best illustrated by development guideline #9 of the Parks and Recreation section of the Calgary Plan, 1970. "...obtain continuous public access to all riverbanks, with the objective of providing pedestrian continuity throughout the city...".

Further, during the course of this study and as is noted in the section on Public Response, many people and community organizations have included river usage and access as one of their concerns for the future of their communities. Indeed, the initiation of this study itself represents a reflection in changing attitudes.

While there is growing concern for this relationship between community and river, no final set of objectives has been determined to describe the role of the Bow River in the life in Calgary. The determination of these final objectives is the role of the citizens of Calgary. In that determination it is important that there is an understanding of the basic aspects of community and river, of the social, recreational, and biological worlds. It is also important to note that these objectives will be determined as well by the values held by the community. As such, two seemingly agreeable objectives may result in conflicts of value and a "choice" will have to be made.

As an overview, and in light of the Bow River Flood Study proposals, the following basic objectives have been established by Lombard North regarding the role of the Bow River in all life of the City of Calgary.

(a) That there is a need to establish flood control measures that will reduce the potential loss of life, property damage, etc.

(b) That it is desirable to preserve and protect the natural communities of the Bow River for the education and pleasure of the citizens of Calgary, both present and future generations.

(c) That it is desirable to retain riverbank space for the recreational pursuits of the citizens of Calgary and that this space be readily accessible to the various communities.

(d) That it is desirable to protect and accentuate the visual qualities of the Bow River as a means of establishing a pleasing overall image for the communities and users along the river and for the city as a whole.

(e) That in realizing the above objectives, it is desirable that no undue economic or social hardships be placed on individuals or communities directly or indirectly affected.

C. THE ESSENCE OF THE BOW RIVER FLOOD STUDY REPORT

The Montreal Engineering Report has been made available to the public as has the Lombard North Summary Report titled "But What if we Had a Flood". Further explanation was facilitated through graphic and verbal presentations at a number of public meetings. Therefore, for the purposes of this report we have limited the discussion on this subject to a verbatum reproduction of the section of the Montreal Engineering Report, titled "Findings, Conclusions and Recommendations".

1. This study is concerned with potential flooding along the 24 mile reach of the Bow River from 85th Street N.W. downstream to 1,000 feet below Fish Creek and along Fish Creek. (Fish Creek is dealt with in a separate volume of this report.) A repetition of the flood of 1897, with a peak flow of 80,000 cfs above the Elbow River and a return period of approximately 1 in 70 years, would result in some 2,500 dwellings and 350 commercial and industrial establishments being directly affected by overland flows. There is also a possibility of peak flood flows substantially greater than those experienced to date. Clearly potential flooding along the Bow River poses a problem of significant dimensions.

2. Based on present values, the average annual damage from flooding throughout the City will, in the long-term, amount to about $400,000. Potential damages to residential properties alone represent almost 50 per cent of this figure. Damage from a single flood of 80,000 cfs would be about $10 million. The damage estimates have been made on the assumption of idealized flow conditions, e.g. no blockage of bridges or extraordinary high water levels resulting from rapid failure of stream banks.

3. Of a total flood plain area of 5,278 acres at a flow of 80,000 cfs (110,000 cfs below the Elbow River), some 4,156 acres are in open-space use. Consequently, if this area were developed in a manner similar to presently developed areas, the degree of the potential flood problem through the City could be greatly magnified. Thus, the need to deal with the problem in an effective manner is well established.

4. There are two fundamental approaches for alleviating the potential problem; one based on the control of floods through large-scale engineering measures such as reservoirs and dykes, and the other based on the control of land-use in the flood plain through administrative measures such as zoning ordinances, i.e., flood plain management. While these approaches are not mutually exclusive and, in fact, are generally complementary, one approach will usually predominate depending on the economics of the situation. The lack of economically feasible and socially acceptable large-scale engineering possibilities points strongly to the need for flood plain management in the City of Calgary. The

appropriate strategy will comprise a mix of modest engineering measures coupled with firm management of developments in the flood plain (see Item 6).

5. A two district concept of flood plain management has been applied to lands adjacent to the Bow River (and Fish Creek). (See Illustration). This results in 1,585 acres immediately adjacent to the river being designated as a Floodway District and 3,693 acres being designated as a Flood Plain District. The Floodway District would be reserved for open-space use, such as parkland, and in general, no further development of a structural nature would be permitted. Development would be permitted in the Flood Plain District provided that it conforms to certain structural requirements. Recommended guidelines applicable to each district are presented.

6. Opportunities to construct large-scale engineering works to control summer flooding of the Bow River are limited. Moreover, the opportunities that do exist are uneconomic (in terms of potential damages avoided) and, in certain instances, may be socially untenable.

Flood Storage

Of the existing reservoirs only Ghost offers an opportunity for reduction of the flood peak in the City of Calgary. Whilst even in the case of Ghost, the opportunity is limited it has been concluded that supplementing the existing flood forecasting procedures with recently developed forecasting techniques holds promise and may permit a greater degree of flood control without compromising power, irrigation and recreation demands on the reservoir.

It must be stressed, however, that only a relatively small reduction in the overall potential hazard in Calgary is possible.

The construction of new storage reservoirs for flood control is clearly uneconomic and should be dismissed from further study.

Dykes

With the possible exception of a scheme to protect the Pearce Estate, Inglewood Area, dyking as a measure to provide a reasonable degree of protection to developed areas is not a feasible proposition along the Bow River. The costs of the various dyke schemes evaluated during the study would generally be several times the benefits achieved in terms of flood damages prevented, and, moreover, there could be opposition by residents of the flood plain and others because of the attendant loss of aesthetic values.

Major Channel Improvements

Dredging or a general widening of the river channel to reduce flood levels is not economically feasible and is undesirable from the standpoint of channel stability and the detrimental aesthetic and environmental impact such measures would have. This alternative should be dismissed from further study.

7. A number of channel improvements involving the removal of severe constrictions to flow are recommended for implementation. A programme of improvements costing in the region of $985,000 (excluding works below Crematorium Hill) is recommended for implementation at the earliest opportunity. The principal improvements required are:

- the bend in the river below Crematorium Hill (this work is already underway);
- in the vicinity of St. George's Island involving in the main the removal of the landfill at the south end of the South St. George's Island Bridge;
- on both banks upstream and downstream of Langevin Bridge;
- to the south bank alignment downstream of Crowchild Bridge;
- to both banks in the vicinity of Cushing Bridge.

8. The extent and effectiveness of emergency action in anticipation of a major flood is largely dependent on how early the warning is given. Supplementing the existing forecasting system with recently developed techniques involving a computerized watershed simulation model will facilitate emergency action by advancing the time at which an accurate forecast and realistic warning can be given. Progress in this direction has been made recently by the Water Survey of Canada.

It is recommended that a flood forecasting centre be established. Step-by-step procedures for the issuing of flood warnings and action by the City should be drawn up.

9. When compared to the critical slide area below Crematorium Hill (which is presently being stabilized) and the slide area below Wildwood Drive which has been recommended for detailed investigation, other potential slide areas adjacent to the river appear relatively stable. However, it is recommended that two active slide areas downstream of Gallelli's Bridge should be monitored in detail prior to development on adjacent flood plains or subsequent to the passage of a flood if erosion of the bank is significant.

10. Using the flood plain district maps as a guide, it is recommended that:

(i) No mining for gravel or stockpiling of material be carried out in the Floodway District.

(ii) Subject to other regulations not pertinent to flooding, mining be permitted in the Flood Plain District provided that:

- a buffer zone of undisturbed material with a minimum width of 100 feet be left between the channel and the mining operations;

- a stable dyke comprising cobbles or rock be built along the buffer zone to an elevation compatible with the step limit elevations shown on the recommended district maps.

11. There is a pressing need to provide bridges which will remain in operation during a flood of 80,000/110,000 cfs, especially along the downtown reach. It is recommended that the net width of future bridges be the width of the Floodway District and that low chord elevations be some 4 feet above the step limit elevations shown on the recommended flood plain district maps. The approaches to such bridges should not be lower than the step limit elevations. It should be noted that the existing Louise, Centre Street, Old Langevin, Baines and Cushing Bridges do not meet one or both of these criteria.

12. A public information programme is needed to gain public acceptance of the measures which have been recommended and give the Province and the City a clear mandate to proceed with their implementation.

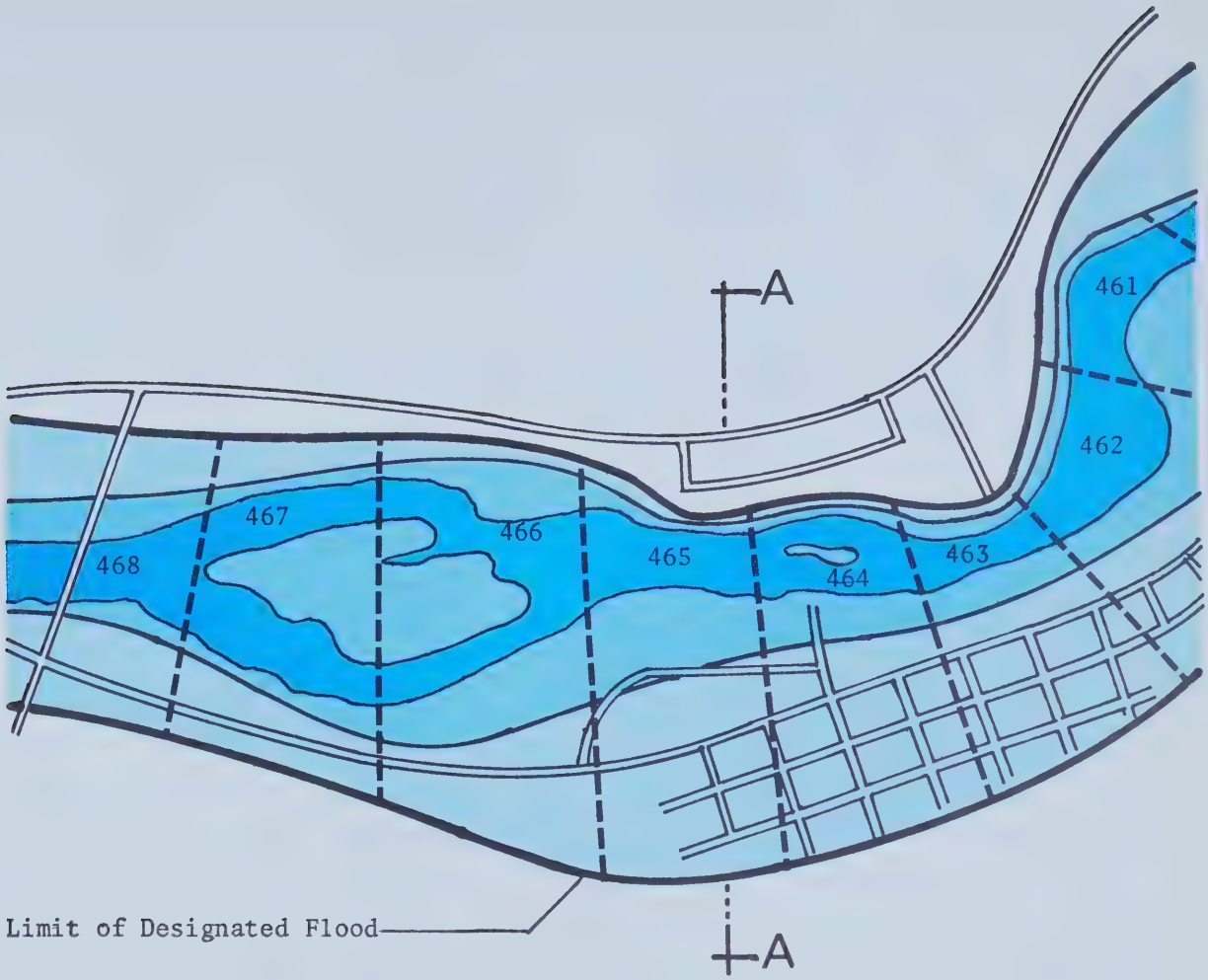
13. In summary, the strategy to deal with the potential flood hazard in the City of Calgary in an optimum manner which has evolved during the study comprises the following main elements:

(i) The adoption of statutory regulations for controlling development in the flood plain;

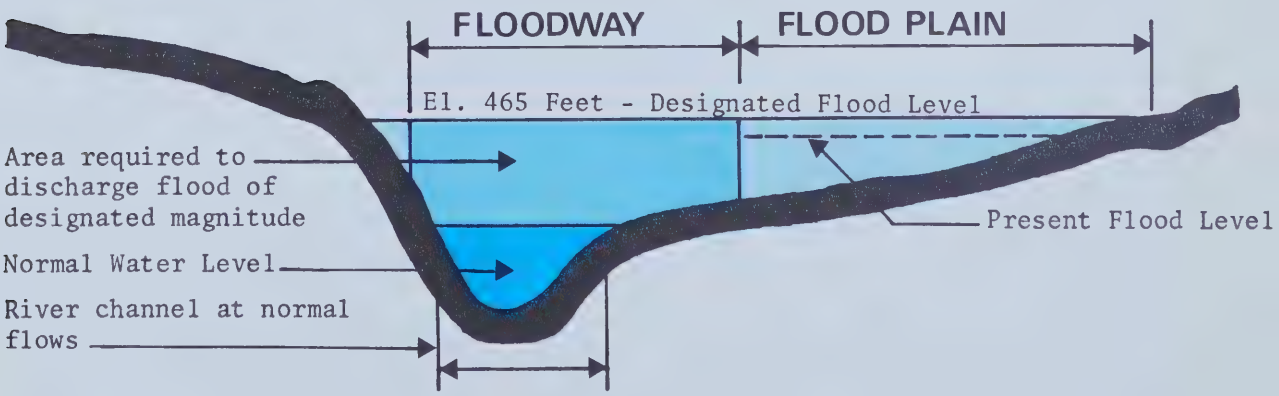
(ii) The establishment of a flood forecasting centre by a Federal or Provincial agency and the establishment of step-by-step procedures for the issuing of flood warnings and action by the City;

(iii) Channel improvements involving the removal of severe constrictions to the passage of flood flows;

(iv) A public information programme.



PLAN


FLOODWAY
FLOOD PLAIN
El. 465 Feet - Designated Flood Level
Area required to discharge flood of designated magnitude
Normal Water Level
River channel at normal flows
Present Flood Level

SECTION A

ILLUSTRATION ■
FLOODWAY & FLOOD PLAIN DISTRICT CONCEPT.

As per Figures 3-1, The Bow River Flood Study Report,
Montreal Engineering Company Limited

PART 3. ANALYSIS AND IMPACT ASSESSMENT

SECTION 1. COMMUNITIES IN THE RIVER VALLEY-AN INVENTORY AND ANALYSIS

SECTION 2. COMMUNITIES AND NEW DEVELOPMENT-AN IMPACT ASSESSMENT

SECTION 3. A VISUAL ANALYSIS AND IMPACT ASSESSMENT

SECTION 4. A RECREATIONAL ANALYSIS AND IMPACT ASSESSMENT

SECTION 5. A BIOLOGICAL ANALYSIS AND IMPACT ASSESSMENT

AN ANALYSIS-IMPACT ASSESSMENT

PART 3

SECTION 1. THE COMMUNITIES IN THE RIVER VALLEY - AN INVENTORY AND ANALYSIS

A. PURPOSE

B. METHOD OF APPROACH

C. INVENTORY AND ANALYSIS

1. Communities Directly Affected

   (a) Bowness
   (b) Montgomery
   (c) Hillhurst-Sunnyside
   (d) Inglewood
   (e) Downtown
   (f) Bridgeland

2. Communities Indirectly Affected

   (a) Wildwood, Spruce Cliff
   (b) West Hillhurst
   (c) Parkdale, Westmount
   (d) Ogden-Millican

3. Additional Zones

   (a) Mixed
   (b) Agriculture

COMMUNITIES IN THE RIVER VALLEY, AN INVENTORY AND ANALYSIS.

SECTION 1

SECTION 1:

THE COMMUNITIES IN THE RIVER VALLEY - AN INVENTORY AND ANALYSIS

A. PURPOSE

In order to understand the impact of the Flood Study proposals on the various aspects of man's involvement with the river, those aspects must first be clearly delineated. This section presents an inventory of the man-made characteristics of the flood plain, and an analysis of how these characteristics affect the city's relationship with, and utilization of, the river.

B. METHOD OF APPROACH

The commmunity boundaries within the Bow River Valley are far more than an arbitrary dividing line between neighbourhoods. These boundaries in actuality separate areas of different socio-economic characteristics, land use patterns and for the purposes of this study, relationships to the river.

Thus the inventory and analysis was done in terms of the communities adjacent to the river with a minimal manipulation of their established boundaries. Those communities which would have a significant proportion of their land area within the flood plain, as delineated by Montreal Engineering, are classified under "direct" impact. Conversely, those communities which would have only a small portion of their land within the flood plain - or none at all - are classified under "indirect" impact.

The organization of this section follows this rationale, with the addition of two other zones in the downstream reach of the river. These zones were delineated on the basis of land use, and are called "mixed", and "agricultural".

The subsection on community areas subject to a "direct" impact, contains two main parts. The first part presents an inventory of the land uses within the flood plain area for each community as based on Map 1, Land Use Inventory. The second part presents an analysis of that community's relationship to the river. The major concerns in the community regarding the future of the river are also noted.

The subsection on community areas subject to an "indirect" impact, contains the same two parts. However, since very little of the land actually lies within the flood plain, the land use inventory is not as detailed.

The final subsection on the two additional zones, gives a detailed land use inventory. However, since the city as yet has only a minimal relationship with the river in these areas, the analysis is not as specific as for the previous subsections.

Please note that the text contains guideline numbers which refer to Map 2, Community Inventory. These areas or aspects of man's relationship with the river, were considered either critical or representative of general trends regarding river usage.

Also note that the figures given in the tables, as well as in the City Overview Section, are specific only as is necessary to describe a general level of impact.

C. INVENTORY AND ANALYSIS

1. COMMUNITIES DIRECTLY AFFECTED

(a) BOWNESS. The Bowness community, in the northwestern corner of the city, is the first residential area to be reached by the Bow River. The river forms its northern boundary, with the Trans-Canada forming the southern. The community is unique in many ways, resulting from the fact that it is the only major area to have become fully developed, before being annexed by the City of Calgary.

(i) Inventory

Residential. Bowness is a stable residential area, with the only major development pressure being the replacement of the many smaller and older houses by more expensive single family housing in the flood plain area, generally in that area north of Bowness Road, due to the attractive proximity of the river. There has also been some development of duplex and fourplex units south of Bowness Road. The old housing stock is often smaller and is placed on lots that are smaller than would have been allowed if Bowness had developed as part of Calgary. There are some 330 residential buildings in the flood plain area. This figure includes the vast majority of the new single family housing units being developed.

Commercial, Educational. The commercial activity in Bowness is restricted to a strip along Bowness Road from 61st Street Northwest to 65th Street Northwest, as well as the Bowness Shopping Centre at 79th Street and Bowness Road. Of this commercial activity some 10 stores lie within the flood plain. There are no schools in the flood plain, however the Bowcrest Nursing Home (1) does lie within the area defined as subject to flooding.

Industrial. There is no industrial activity in the Bowness flood plain, however immediately across the river from Bowness, there is a gravel mining operation on some 40 acres of floodway and 60 acres of flood plain land.

Recreational. There is no developed recreational areas within the flood plain, although the regional Bowness Park which lies immediately outside of the terms of reference of this study, lies wholly within the flood plain.[1]

Open. There are two areas of open land use within the flood plain - one publicly owned and consisting of some 16.5 acres, and one owned by the C.P.R., of 25.5 acres. In addition, there are two river islands, lying within the floodway. Since these are natural islands, and are not within the Bowness community, they are discussed elsewhere.

TABLE 1. LAND USE WITHIN FLOOD PLAIN - BOWNESS

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	145	9	/	/	42
No. of Units	330	10	/	/	/
% Distribution	73	5	/	/	22

(ii) Analysis

Organization. The Bowness Community has a set of rigidly defined boundaries which include the Bow River and the river valley escarpment. Within these boundaries the area has become fully developed. Bowness Road appears to be the dividing line between the older, heavily treed river community to the north and the newer residential areas south of the road.

River Objectives, Relationship. The objectives of the riverbank residents, vis-a-vis the river, centres around the maintenance of the present situation of private control of the river banks. This condition of private control arose out of the fact that the lot lines of river properties were originally drawn down to the 'first line of vegetation', which meant literally to the water level.

1. See Flood Plain of Bow River in the City of Calgary, Volume 11, Montreal Engineering Limited, February, 1968.

River Access. Thus, access to the river is controlled by private property by a degree not found anywhere else in the city. A continuous stretch of some 100 properties front on the river. Elsewhere, river access is gained through the undeveloped C.P.R. land, or the undeveloped portion of Bowness Park. Bowness Park is in actuality the only area of formal access to the river.

River Condition. The private land owners on the river, while wishing to maintain their position, do not take full advantage of their location. Within the context of the private backyard, there is rarely any actual orientation towards the river in the form of steps leading down to the waters edge, etc. The backyards are no different from other lots in the area of houses not facing the river. This is particularly true in those areas where the day-to-day visual access to the river has been cut off by the existence of dyking (2).

River Perception. The necessity of day-to-day visual access to the river, for any type of orientation towards it, seems to be consistant throughout the city. In Bowness, this access is denied by the extent to which the river area is controlled by private property. Thus, a perception of the river is limited to this first line of properties.

(b) MONTGOMERY. The Montgomery community is the next residential area to be reached by the river. It's western boundary is defined by the Bow, and it's eastern by MacKay Road. Montgomery, in conjunction with Bowness, represents the "outer fringe" residential areas adjacent to the river in the north-western sector of the city.

(i) Inventory

Residential. Montgomery shares many of the characteristics of Bowness, in that it is a stable residential area, with the majority of development pressure consisting of the building of duplex and fourplex units. The flood plain area contains some 50 residential units. This figure includes 11 houses adjacent to the river on extremely large lots (400 feet by 100 feet). Also, included in this total is the Bow View Nursing Home (3), which has been suggested for relocation, by Montreal Engineering.

Commercial, Educational. The commercial activity in the area is concentrated on a strip along Trans-Canada Highway from Bowness Road to the intersection with 3rd

Avenue, Northwest. The commercial areas within the flood plain consists of a shopping centre (Bowmount Shopping Centre) at Home Road and the Trans-Canada and the Bow Bend Trailer Court (4), which for the purposes of this inventory is classified as commercial, although it consists of permanently sited trailer homes. Approximately a third of this trailer court lies within the floodway.

Industrial. There is no industrial activity located in the Montgomery flood plain area.

Recreational. A large portion of the Montgomery flood plain consists of the developed Shouldice Park. This park has two riverbank areas. The area north of the Trans-Canada Highway is well manicured and serves as an urban park, while the riverbank area further south is less developed, consisting of playing fields and unmanicured banks.

Open. Within the immediate Montgomery flood plain area, there is no undeveloped public or private areas. However, there is a large area of open land east of the Montgomery residential area, which has been classified with Parkdale for the purpose of this inventory and analysis.

TABLE 2. LAND USE WITHIN FLOOD PLAIN - MONTGOMERY

	RESIDENTIAL **	COMMERCIAL *	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	53	20	/	70	/
No. of Units	56	4	/	/	/
% Distribution	38	14	/	48	/

* - Includes Bow Bend Trailer Court
** - Includes Bow View Nursing Home

(ii) Analysis

Organization. The only definite limit to the Montgomery community at present is the Bow River. To the east, as well as the north, the residential areas are surrounded by open space. These areas could become available for development should the presently stable situation change.

River Objectives, Relationship. The objectives of the community vis-a-vis the rivers are mainly in terms of preserving the large amount of river bank area presently used as park. In addition, the aesthetic improvement of Crematorium Hill has become a goal of the communities in the area, which include Montgomery and Bowness.

River Access. Because of Shouldice Park, river access is fairly easy, and of a formal nature. This includes an amount of the bank area adjoining the above mentioned large residential lots.

River Condition. However, in only one stretch of the riverbank - that area of Shouldice Park north of the Trans-Canada Highway - is the riverbank fully developed. On the trailer court riverbank, as well as the southern portion of Shouldice Park, the immediate riverbank is ignored. It is left unmanicured, and often serves as a repository for refuse.

River Perception. Due to the location of Shouldice Park vis-a-vis the Trans-Canada Highway, the area provides a regional as well as local recreational service. However, again because of the changing nature of the riverbank, the perception of the river as an element of recreation is restricted to the northern half. A further consideration is the fact that the Trans-Canada Highway cuts off access to the river for the vast majority of Montgomery residents.

(c) HILLHURST-SUNNYSIDE. Hillhurst-Sunnyside, an area of some 10,000 people in 3,600 residential units, is defined as one of Calgary's major Inner City communities [2]. It lies just north of Calgary's core, with the southern boundary being the Bow River, and northern boundary consisting of the escarpment which extends from Centre Street to approximately 16th Street Northwest. The area is Calgary's oldest residential district north of the river, and it existed as a city neighbourhood until Calgary's rapid dispersal as a result of the automobile in 1945-50, turned it into an Inner City area.

The community has a lower than average income ($5,080.00 annually vs. $7,080.00 for the city [3]). Occupations are mainly blue collar, and the age profiles are older than that for the city as a whole, although they are typical for the Inner City.

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2. The Calgary Plan, City Planning Department, 1970.

3. Refer to The Need for a Community Plan, Hillhurst-Sunnyside Community; and the City of Calgary Planning Department.

(i) Inventory.

Residential. As an Inner City area, the community is characterized by an older housing stock, on lots which would be considered too small by today's standards. (25' by 120'). Due to its location vis-a-vis the central core, there is a significant development pressure for apartment units, particularly along 10th and 14th Streets. Virtually all of Sunnyside lies within the flood plain, as does some 60 per cent of the area of Hillhurst. Thus, the flood plain covers a greater proportion of land in these community areas, than virtually any other location in this city. This includes some 1,200[4] residential units in 244 acres. The Sunnyside flood plain area also contains some 40 apartment buildings compared to a total of 70 such buildings within the entire community area.

Commercial, Educational. The commercial activity, along with apartment development, is concentrated in the strips along 10th Street and 14th Street Northwest. The 14th Street area has some six commercial units and 10th Street has some 25 units[4] within the flood plain. The major projected physical alteration to the Hillhurst-Sunnyside area is the twinning of the Louise Bridge (5) in conjunction with the development of 10th Street and Memorial Drive as major arteries. Thus, the majority of development pressure within the area is concentrated along 10th Street - almost entirely within the flood plain. The pressure may serve to change the commercial services from a local to a regional basis, as the usage of 10th Street as a through street increases.

There are three schools within the flood plain area - two in Sunnyside, and one in Hillhurst.

Industrial. There is no industrial activity located in the flood plain area of Hillhurst-Sunnyside.

Recreational. There are two major recreational developments contained within the flood plain. This includes part of Riley Park (6), as well as Memorial Drive Park (7), which stretches between the river and Memorial Drive, for the entire length of the community. Riley Park is typical of the manicured urban parks of Calgary, and, the Memorial Drive Park is an example of one of the more positive uses of river bank areas. The park was established on the area taken by the construction of the dyke built for winter flood protection, and the line of mature poplar trees was planted in memory of the Calgarian soldiers killed during World War I. (Hence the name Memorial Drive). Also, within walking distance is Prince's Island.

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* The figure regarding the number of units may not agree with other sources. This figure refers to the number of residential buildings, for the purpose of the Impact Study, rather than, say, apartment units.

Open. As is typical of the majority of Inner City areas, there is no undeveloped open space in the community. However, the escarpment which defines the northern boundary is at present unmanicured. This escarpment is planned as part of the city-wide bicycle path and pedestrian system.[5]

TABLE 3. LAND USE WITHIN FLOOD PLAIN - HILLHURST-SUNNYSIDE

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	239	22	/	45	/
No. of Units	1,200	30	/	/	/
% Distribution	78	7	/	15	/

(ii) Analysis

Organization. The river to the south and the river valley escarpment to the north, rigidly define the community boundaries. However, to the west the boundary between Hillhurst and West Hillhurst is less definite, there being no topographic features to refer to. The boundary line is usually drawn at around 17th Street Northwest. Within this river valley, the area consists mainly of older two storey gable roofed houses. The great majority of these houses have verandas, and provide a pleasant environment in conjunction with the many tree-lined streets. There are also a number of well designed three story mansion-styled apartment houses built in the late 1930's. Imposing on this environment are a number of box-like eight to ten story modern apartment buildings, as well as a number of commercial functions whose scale is overly large for the community.

River Objectives, Relationship. Expressed as a major concern by the Hillhurst-Sunnyside Planning Committee [6], is the preservation of those recreation areas threatened by planned road developments. This applies particularly to the Memorial Drive Park. The park is divided length wise, by the dyking, into an actual riverbank park, and a roadside park. The roadside area is manicured and is used by many local residents. The riverbank area is left untouched, and actual access to the water level is through informally laid out pathways.

5. Calgary Plan, City Planning Department, 1970.

6. The Need for a Community Plan, Hillhurst-Sunnyside Community Association, Page 29.

River Access. The importance of the Memorial Drive Park is lessened by the fact that access to the park is made difficult due to the necessity of crossing the heavily used Memorial Drive. As a result, many residents prefer to utilize Riley Park for recreation purposes.

River Condition. The condition of the riverbank area is good. This stretch of the river is one of the better utilized areas, and is an integral part of Calgary's riverbank park system.

River Perception. The stretch of dyking along the river is up to six feet higher than the surrounding land. Thus, the day-to-day visual access to the river is eliminated for most residents. This combined with the barrier effect of Memorial Drive has reduced the perception of the river to those residents who use the park as pedestrians. Thus, the river does not serve as a focal point for the community, to the degree to which it might.

(d) INGLEWOOD. The Inglewood community is the second Inner City area to be discussed. As such, its concerns parallel those of Hillhurst-Sunnyside. However, the inroads of commercial activity in the form of industrial development is much more advanced. The 3,150 residents of Inglewood have an average income of $4,200.00 annually[7], mainly from the blue collar occupations. The age profile is extremely old, with some 20 per cent of the population over 60 years of age.

Calgary was originally established at the confluence of the Elbow and Bow Rivers, which forms the western and northern boundaries of the Inglewood area, respectively. The southern boundary is delineated by the C.P.R. mainline and switching yard. Virtually all of the community lies within the proposed flood plain boundary.

(i) Inventory

Residential. As an Inner City area, the community has a great deal of older, smaller housing stock, some of which is in relatively poor condition. (10 per cent either in poor or very poor condition[8]).

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7. Data taken from Inglewood Design Brief, Inglewood Community Association, 1973.

8. Community Plan for Inglewood, Page 10.

However, over half of the residents own their own homes, with only some eight per cent of the population living in apartments. A large proportion of the Inglewood residents (one in five) live in rented rooms in these houses. There is at present no pressure for the development of any apartment units in addition to the low standard walkups existing on 9th Avenue, Southeast. There are some 590 residential units within the flood plain, in the Inglewood area.

Commercial, Educational. The commercial activity is concentrated along 9th Avenue Southeast, from the Elbow River to 14th Street Southeast (8). It consists of some 60 units in an area of 26 acres, all lying within the proposed flood plain boundaries. This commercial concentration serves a regional market rather than merely a local one. It is characterized by a low aesthetic standard as well as a preponderance of auto-related services reflecting its location on a major through route.

Reflecting the general look of development pressure in the area, there is no rehabilitation or rebuilding of this commercial zone at present. This is opposite to the Hillhurst-Sunnyside retail strip in the flood plain, which is subject to more intense development pressure.

There are two schools in the Inglewood area, Colonel Walker High School and Alexandra Elementary School, both of which lie within the flood plain.

Industrial. The Inglewood area is characterized by a great many industries located within the flood plain, as well as an amount of land held as industrial reserve. Those industries located within the flood plain include the following:

Conforce Concrete (9)
Hector's Steel (10)
*Calgary Brewing
*Gulf Oil
*Consolidated Concrete (11)

The industries have all been established in the area for a number of years. The majority of the land in the Inglewood area is at present scheduled for industrial expansion.

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* A portion of the land holding lies within the flood plain for these industries.

Recreational. The Inglewood area has two major developed recreational areas within the flood plain - the Zoo and the privately owned Inglewood Golf Course. Both areas lie entirely within the flood plain, with the Zoo on St. George's Island and the campground on St. Patrick's Island consisting of 62 acres, and the Inglewood Golf Course of 222 acres. However, both of these areas serve a regional function, attracting visitors on a city wide basis, rather than serving a local need. Further, both areas necessitate crossing the river to reach them, for Inglewood residents.

Open. There exists two types of open undeveloped areas in the Inglewood area, that held by industry as reserve and those areas maintained by the city as undisturbed natural areas. This latter classification includes Pearce Estate and the Inglewood Bird Sanctuary, both of which lie entirely within the flood plain. There is virtually no undeveloped private land holding within the flood plain. The two major public areas again serve a regional role, rather than fulfilling a local need.

TABLE 4. LAND USE WITHIN FLOOD PLAIN - INGLEWOOD

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	185	26	113	300	191
No. of Units	590	60	/	/	/
% Distribution	23	3	14	37	23

(ii) Analysis

Organization. The Inglewood area, has a mixture of land uses that reflect a community in transition. What was once primarily a residential area, is now a mix of commercial/industrial/residential uses. The river area, despite containing some of the most aesthetically pleasing aspects of river usage, has a generally unpleasant environment. Concentration of residences are separated by rail lines and industrial concerns.

River Objectives, Relationship. The objectives of the community vis-a-vis the river, as outlined by the areas design brief, are very clear. The establishment of a continuous riverbank park, incorporating the Fort Calgary site, the golf course, Pearce Estate, and the Bird Sanctuary is the primary concern. It is hoped to use the Bow River as a focal point for the community. This river use is not present today to any significant degree.

River Access. Access to the river, though often informal, is usually relatively easy. The three industrial properties fronting the river generally allow access to their portions of the riverbank. The publically owned undeveloped areas allow easy river access. However, the two developed recreation areas on the river ironically do not provide easy access to the water level. St. George's Island is actually fenced around its perimeter, while the Inglewood Golf Course does not permit the casual use of its riverbanks.

River Condition. Reflecting the mix in land uses in the area, is the change in river condition from well manicured to virtually ignored vacant land areas. Outside of the well preserved and pleasant natural areas on the river, the southern bank has generally a poor environmental and aesthetic appeal. This area also has a large amount of railway trackage.

River Perception. Thus the majority of the river area from the confluence with the Elbow to the area downstream from the Inglewood community, has been perceived of as a generally unpleasant environment. For this reason, few residents of the area attempt to utilize the riverbanks for recreational purposes. A perception of the river is restricted to those few who traverse the industrial areas separating much of Inglewood from the bank.

(e) DOWNTOWN. Fort Calgary's site at the confluence of the Elbow and Bow Rivers is the eastern boundary of the downtown area. The Bow River forms the northern, with the C.P.R. tracks forming the southern. Within the downtown area of the flood plain, lies the majority the Inner City community which has perhaps the greatest number of problems as a residential area - Eau Claire (12). Also included in this area is Calgary's only genuine ethnic community - Chinatown (13).

(i) Inventory

Residential. The area delineated as flood plain in the downtown (generally north of 4th Avenue Southwest), contains Eau Claire. The 600 residential units share the same characteristics as the other Inner City communities. They consist of older housing stock, usually of the two story type. The 3,100 people of this area are subject to development pressure from an expansion of the downtown retail core northward as well as the construction of apartment towers servicing the core. However, this development pressure is not as severe as originally predicted in the City General Plan, being at present restricted to the development of parking facilities for downtown workers.

Commercial. The commercial activity within the downtown flood plain lies between Centre Street and 5th Street Southeast. The area includes the commercial development of Chinatown, as well as the majority of the area slated for renewal under the city's Urban Renewal Scheme 1B. West of Centre Street, to 4th Street Southwest, lies the large Calgary Transit System garage complex (14). Of this commercial area, 130 acres are within the immediate flood plain and consist of approximately 100 commercial units. This area has not yet come under intensive development pressure, as developers prefer to build to the west of the downtown core until city policy regarding this area is better known.

Industrial. Industrial activity in the downtown flood plain consists of industries located at the terminus of the C.N.R. branch line around the Fort Calgary site. The largest industry in terms of area in this location, is the scrap metal operation located on riverbank property opposite St. Patrick's Island (15).

Recreational. The recreational area of the downtown flood plain consists of Prince's Island. This island presents the most positive use of the rivers potential for recreation purposes, within the project study area. The lagoon, constructed as a by-pass channel for water during the winter, is used for paddleboats and the immediate riverbank is utilized for sunbathing. Here, land is manicured right down to the water level, orienting activities to the river channel. This situation occurs only rarely within the city limits.

Open. As is expected in a downtown area, there is no significant undeveloped land within the flood plain, either public or private, although some 5.5 acres of Prince's Island has been left undeveloped.

TABLE 5. LAND USE IN FLOOD PLAIN - DOWNTOWN

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	73	129	22	31	/
No. of Units	600	100	4	/	/
% Distribution	29	57	5	9	/

(ii) Analysis

Organization. Although the northern boundary is strongly delineated by the Bow River, the southern boundary is fluid, being essentially defined by the change in land use. Generally, the downtown area is considered to be north of the C.P.R. mainline, with the residential portion lying north of 4th Avenue Southwest. The inroads of commercial development in the form of parking lots is particularly noticeable throughout this area.[9] This has resulted in a generally unpleasant environment, which is coupled with the poor appearance of the commercial establishments in the area - particularly along riverbank properties.

River Objectives, Relationship. Although an amount of the riverbank area in this location is still subject to policy determination, the general objective vis-a-vis the river, is the preservation of riverbanks as part of the continuous riverbank park system. The north bank park along Memorial Drive would be connected to the south bank system by the pedestrian bridges across Prince's Island. Further, it is hoped to turn 3rd Avenue Southwest, into a pedestrian mall, connecting Prince's Island to the central core.[10]

River Access. This would facilitate access to the river for the downtown worker, as well as the downtown apartment dweller. A major factor in river access in this area is the CTS garage complex which eliminates river-bank usage for 800 feet. This situation is subject to change however, as the complex may be removed. The other major factor in river access is the scrap metal operation, which cuts off access to the area around the confluence of the two city rivers. This situation is also subject to change, if and when the operation is relocated, and the site is developed as an historical park.

River Condition. The CTS complex and the scrap metal operation are also the two major examples of an unpleasant river condition. However, this situation occurs along the majority of the downtown stretch of the river, and includes the neglected areas under and around Centre Bridge and Langevin Bridge, as well as a number of unsightly commercial establishments, whose rear entrances face the river bank.

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9. For a graphic example of this, refer to page 28 of Downtown Open Space, City Planning Department.

10. Reference - Downtown Open Space, City Planning Department.

River Perception. Given this condition, the river area is not perceived of as a pleasant environment by either the transient worker or permanent resident, in many cases. Unfortunately, this perception tends to extend to Prince's Island. Thus, this park as yet is not fulfilling its projected role as an urban core park. However, it is concluded that this situation regarding a generally poor river environment has the greatest potential for change in the downtown area.

(f) BRIDGELAND. Bridgeland is the last of the Inner City communities which will be discussed. The area lying within the flood plain is situated between the Bow River and the river escarpment to the north, and lies immediately downstream of Hillhurst-Sunnyside. However, the majority of the Bridgeland community lies north of this escarpment.

(i) Inventory

Residential. The flood plain area of Bridgeland is almost exclusively a stable residential area of single family residential units. There are some 10,600 people within the river valley. Within the flood plain, are some 150 residential units, which includes a public housing apartment tower, as well as a rehabilitation centre. This Inner City area has, again, an older population (1/3 of the residents have resided in the area for over ten years), living in an older than average housing stock. Bridgeland however, is unique amoung the Inner City areas, in that it is not subject to any appreciable development pressure.

Commercial. This however, may change as the new Langevin Bridge system may provide an impetus for the expansion of the presently very small commercial area on Edmonton Trail. There are no institutional functions within the flood plain except for the above mentioned public housing and rehabilitation centre. However, immediately outside of the flood plain, lies the General Hospital, a nursing home, and the CNIB complex (16).

Industrial. There is no industrial activity within the Bridgeland flood plain.

Recreational. A major recreational development in the flood plain is the area of Zoo expansion at the confluence of the Bow River and Nose Creek, consisting of some 13 acres (17). In addition, the Memorial Drive Park extends eastward from Hillhurst-Sunnyside to the general area of Zoo expansion.

Open. As is typical of an Inner City area, there is no open undeveloped land within the flood plain. However, the area around Nose Creek, which forms the eastern boundary of the community, is undeveloped. This situation will change in the very near future, as the Blackfoot Trail is extended along the creek.

TABLE 6. LAND USE IN FLOOD PLAIN - BRIDGELAND

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	66	/	/	33	/
No. of Units	150	/	/	/	/
%Distribution	66	/	/	33	/

(ii) Analysis

Organization. The community boundaries within the river valley are defined by the river, the escarpment, and Nose Creek. Within these boundaries, is a stable, pleasant residential environment. Because of the lack of development pressure up to the present, there is no conflicting mixture of land uses. The institutional area which includes the hospital, CNIB, the rehabilitation centre and a nursing home, is clearly separated from the residential area.

River Objectives. The community objectives vis-a-vis the river centres around the maintenance of the riverbank park - particularly in light of the combined effects of the new Langevin Bridge complex, and the extension of the Blackfoot Trail.

River Access. These road projects serve to reduce the already difficult access to the riverbank park. The situation whereby Memorial Drive separates the river from local residents, parallels that of Hillhurst-Sunnyside.

River Condition. The immediate river environment however, is one of the more pleasant within the city. This is a result of the combination of the riverbank park as well as the view of the Zoo area from the bank. It is worthy to note that the new Langevin Bridge is the only bridge which allows continuous river access along the bank, through the provision for a pedestrian underpass. The Centre Street, 10th Street, and 14th Street Bridges all provide interruptions to a river walkway.

River Perception. However this environmental appeal is not realized by the majority of area residents due to the combined lack of physical and visual access. Thus, the perception of the river is restricted to those people who utilize the Memorial Drive Park on feet, or by bicycle.

2. COMMUNITIES INDIRECTLY AFFECTED

(a) WILDWOOD, SPRUCE CLIFF

(i) Inventory

Land use. This general residential area was created in the decade following the Second World War. Thus, it represents the second phase of Calgary's growth following the establishment of what are now the Inner City areas. The area is a stable residential district, with an average income level and age profile. However, lately there has been an increased amount of development pressure. The edge of the escarpment in Spruce Cliff is changing over to expensive housing, which has been attracted by the view (18). The only land use within the flood plain area consists of developed recreation (Edworthy Park), and undeveloped public land (Lowery Gardens).

TABLE 7. LAND USE IN FLOOD PLAIN - WILDWOOD, SPRUCE CLIFF

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	/	/	/	33	74
No. of Units	/	/	/	/	/
% Distribution	/	/	/	31	69

(ii) Analysis

River Objectives. The community's objectives vis-a-vis the Bow River are two fold. First, Lowery Gardens is desired as a developed recreational area in conjunction with Edworthy Park. Second, access to the river park system is at present very difficult. Wildwood, and Spruce Cliff residents must traverse the steep escarpment in the area (19), as well as cross the C.P.R. mainline (20). Thus, a more formal and easier access to the riverbank is desired.

River Access. At present, although the immediate river area is a pleasant combination of natural area and manicured park, access to it is afforded only through informally laid out paths down the escarpment. Alternatively, access may be gained through the western end of Edworthy Park, as it extends out of the river valley (21). However the roadway into the

park is very seldom used and is not well know. The access to Lowery Gardens from the area of the Crowchild Trail Bridge is controlled by C.P.R. property. Thus, usage of the riverbank in this area, due to the critical access problem, is minimal.

River Condition. If this access problem were solved river usage would no doubt increase substantially due to the pleasant river area. The area encompassing Edworthy Park, the escarpment, and Lowery Gardens has been classified as naturalby the Calgary Field Naturalists. The presence of the C.P.R. mainline has not disrupted the area to a very great extent. The major disturbance is in the form of noise, as trains pass by. Clean fill operations in Lowery Gardens have been completed, in preparation for park manicuring.

River Perception. As a result of the usage patterns in this area, there is a very limited perception of the river. Further, the notion of an access problem to the river is confined to those community residents who perceive of the riverbank area as serving a recreational function for the community

(b) WEST HILLHURST

(i) Inventory

Land use. West Hillhurst as the name implies, is an extension of the Hillhurst residential area. If the eastern boundary is taken as 17th Street Northeast, there are some 85 residential units within the flood plain. The vast majority are single family residences. In addition, there is a residential playground and a Boy Scout Meeting Hall. The only other land use type found within the flood plain is a small quantity of undeveloped public land between Memorial Drive and the river. This land could conceivably become the western extension of the Memorial Drive Park.

TABLE 8. LAND USE IN FLOOD PLAIN - WEST HILLHURST.

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	35	/	/	/	/
No. of Units	85	1	/	/	7
% Distribution	91	1	/	/	8

(ii) Analysis

River Objectives. The community has few objectives regarding the river. Much of the recreational activity of the community is directed towards the river valley escarpment to the north. This situation parallels Hillhurst-Sunnyside.

River Access. The situation is similar to downstream communities in that river access is restricted by Memorial Drive. The situation is worsened by the existence of the complicated intersection between Crowchild Trail and Memorial Drive which makes river access all but impossible for a stretch of four blocks east of Crowchild Bridge.

River Condition. There is no compensation for this situation, by the existence of a mainicured river park. The area is at present left undeveloped.

River Perception. As a result, any perception of the river is minimal, being restricted to those pedestrians who take the trouble to cross a chain link fence and a divided roadway.

(c) PARKDALE, WESTMOUNT

(i) Inventory

Land use. The flood plain in the Parkdale-Westmount area covers a large amount of privately owned land which has been proposed for a high rise development complex by Famous Players Development Corporation. Approximately one-third of this land area is now occupied by the Cinema Park Drive-In (22). The flood plain also affects some 28 residential units. Should this development proposal be adopted, it is expected that the land use situation in the area will dramatically change - particularly in the open space referred to in the section on Montgomery.

TABLE 9. LAND USE IN FLOOD PLAIN - PARKDALE-WESTMOUNT

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	11	21	/	/	31
No. of Units	28	1	/	/	/
% Distribution	20	33	/	/	47

(ii) Analysis

River Objectives. Since the majority of the flood plain land in this area is privately owned, there are few stated objectives regarding the publically owned riverbank, by residents in the area. City policy, however, in the light of the possibility of intensive development in the area may well be to preserve the riverbank, and riverbank access for the purpose of a river related park.

River Access. Access to the river in this area is relatively easy, as the barrier effect of Memorial Drive is replaced by the smaller scale of Bowness Road.

River Condition. The lack of a formal river park in the area does not seem to have detracted from the appeal of the area. It has a pleasant environment, due mainly to the natural escarpment area (19) on the opposite bank.

River Perception. Because few houses are situated in this area of informal river usage, the people utilizing the area tend to be drawn more from the region, rather than the immediate community.

(d) OGDEN-MILLICAN

(i) Inventory

Land use overview. For the purpose of this inventory, the area from Bonnybrook Bridge to Graves Bridge, was considered within the Ogden-Millican area.

The Ogden-Millican community is located in the southeast sector of the city. The area is bounded by the Glenmore Trail to the south, the Bow River to the west, and the C.P.R. tracks to the east. Although at present no developed part of the community is situated near the river, or even within the flood plain, the area has a vital concern with the Bow River. The concern is in terms of the future of park space, and the problem of river access. This situation closely parallels Wildwood, Spruce Cliff.

(ii) Analysis

River Objective, Relationship. These two objectives for the development of the Bow River for recreation, as well as improved access to the immediate river area, is at present being fulfilled. The land held by Imperial Oil,

between the developed residential area and the river, is presently being developed as a residential area in conjunction with Nu West. Further, the flood plain in that location has been donated to the city for development as a park (24). Since development would not be allowed on the escarpment between this park and the new residential areas, access to the river would be facilitated.

River usage. At present, however, the river is used only on an informal basis due to the lack of any developed river recreation facilities. The Imperial Oil refinery (23) also controls access to the river. However, this industry has indicated its possible desire to relocate elsewhere.

River Condition. Although much of the land is controlled by industry, the immediate river area is generally left untouched. Thus, none of the floodway area is at present utilized. Much of it has been left in a natural state.

River Perception. However, due to the often impossible access to the banks, the river is not utilized to any great extent. The only exception to this is the informal usage of that area donated to the city as a future park, by school children.

TABLE 10. LAND USE IN FLOOD PLAIN - OGDEN-MILLICAN

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	/	/	34	/	81
No. of Units	/	/	/	/	/
% Distribution	/	/	30	/	70

3. ADDITIONAL ZONES

(a) MIXED

(i) Inventory

Residential. There is at present no residential areas within this zone. Further, the Calgary Plan proposes that no residential areas be developed in the flood plain within this zone, in the future.

Commercial. No commercial facilities exist in the area today. In lieu of any future residential development in the area, the city does not propose to develop any commercial facilities within the area's flood plain.[11]

Industrial. Two types of land use predominate in this area - industrial and undeveloped private land. The industrial area within the flood plain comprises some 460 acres. This area is further broken down into 360 acres of gravel mining operations, and 100 acres of intensive feedlots.

Recreation. There is at present no developed recreational facilities in this zone, although the entire area is slated for industry with the exception of a continuous stretch of river park.

Open. Besides industrial operations, the only other land use within the flood plain in this zone is private, undeveloped land. In this area, this means cattle grazing or agriculture. This land use takes the remaining 840 acres.

TABLE 11. LAND USE IN FLOOD PLAIN - "MIXED"

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	OPEN
Area in Acres	/	/	460	/	840
No. of Units	/	/	6	/	/
% Distribution	/	/	60	/	40

(ii) Analysis

Overview. This area is at present a mixture of industrial and agricultural uses within the flood plain. Many of the gravel mining operations have an effective life of eight to ten years, depending on whether or not the companies are allowed to mine below the water table. Due to the flatter topography of the river valley in this area, the floodway zone often takes up to 30 per cent of the industrial land area within the flood plain.

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11. The residential and commercial land uses in the Barlow Sector (25) may, however be subject to revision.

(b) AGRICULTURAL

(i) Inventory

Residential. There are at present no residential areas within the flood plain, in this zone. However, a portion of this area is slated for a major residential development, according to the Calgary Plan.

Commercial. No commercial facilities exist in the area, although presumably some commercial developments will be allowed in conjunction with the residential development.

Industrial. There are at present no industries operating within the flood plain of this zone, although industry is slated for the area east of the Bow River.

Recreation. No developed recreation facilities occur within this area, although the Fish Creek Park may extend to the confluence with the Bow River, in the future.

Open. The flood plain within this zone consists entirely of open undeveloped land. Some 1,240 acres is privately owned, and in primarily agricultural use. An additional 90 acres is owned by the City of Calgary.

TABLE 12. LAND USES IN FLOOD PLAIN - AGRICULTURE.

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	RECREATION	OPEN
Area in Acres	/	/	/	/	1,330
No. of Units	/	/	/	/	/
% Distribution	/	/	/	/	100

(ii) Analysis

Overview. The area is at present completely undeveloped within the flood plain. The flat topography of the Mixed zone extends through out this area. Thus, because of the large amount of land which is delineated as floodway, the decision as to the implementation of the land management proposals will have a critical affect on the future land uses of a great proportion of the area.

THE BOW RIVER IMPACT STUDY

1

land use inventory

Legend

- commercial, office, institutional
- industrial
- residential, educational
- developed recreation
- undeveloped (private)
- undeveloped (public)

THE BOW RIVER IMPACT STUDY

2

SECTION 2. COMMUNITIES AND NEW DEVELOPMENT
AN IMPACT ASSESSMENT BY COMMUNITIES

A. PURPOSE

B. METHOD

C. CRITERIA

DISCUSSION 1: A General Socio-Economic Impact Assessment - That portion of the Flood Plain already intensively developed.

DISCUSSION 2: A Socio-Economic Impact Assessment - Specific communities existing within the Flood Plain.

(a) Bowness
(b) Montgomery
(c) Hillhurst-Sunnyside
(d) Inglewood
(e) Bridgeland
(f) Downtown East
(g) Eau Claire
(h) Parkdale-West Hillhurst
(i) Wildwood, Spruce Cliff/Ogden-Millican

DISCUSSION 3: A General Socio-Economic Impact Assessment - Potential new development and communities within that portion of the Flood Plain not intensively developed.

DISCUSSION 4: Impact of Limited Engineering Works.

DISCUSSION 5: Impact of Establishing a Flood Forecasting Centre.

DISCUSSION 6: Impact of a public Information Program.

D. CONCLUSIONS AND RECOMMENDATIONS

COMMUNITIES AND NEW DEVELOPMENT, AN IMPACT ASSESSMENT BY COMMUNITIES

SECTION 2

SECTION TWO: COMMUNITIES AND NEW DEVELOPMENT - AN IMPACT ASSESSMENT BY COMMUNITIES

A. PURPOSE

To assess the social and general economic impact of the implementation of the Bow River Flood Study proposals on various elements of the communities affected; on the communities as a whole; and on those areas where future development and community growth may be anticipated.

B. METHOD

The major element of the proposed Bow River Flood Control programme is flood plain management. The engineering works, flood forecasting centre, and public information programme are supplementary components which should have either little or no negative impact on communities in comparison with those impacts arising from the adoption of land use management. Consequently, the bulk of this section deals with the potential impacts of adopting flood plain management, and its associated building construction requirements.

Discussion 1. Is a general assessment of the socio-economic impact of building construction requirements on various types of existing and new development, and communities within that portion of the flood plain already intensively developed.

Discussion 2. Is an assessment of the probable socio-economic impacts on specific communities in adopting these flood plain management requirements, in light of the above, and in terms of flood protection, property values, river access, future development and community integrity.

An assessment of potential impact was undertaken for the following communities:

(a) Bowness
(b) Montgomery
(c) Hillhurst/Sunnyside
(d) Bridgeland
(e) Inglewood
(f) Downtown East
(g) Eau Claire
(h) Parkdale and West Hillhurst
(i) Wildwood, Spruce Cliff, Ogden-Millican

Discussion 3. Is a general assessment of the socio-economic impact of building construction requirements on various types of new development

and potential communities within that portion of the flood plain that is primarily undeveloped.

Discussion 4. Assesses the probable socio-economic impacts of implementing the engineering works.

Discussion 5. Assesses the impact of establishing a flood forecasting system.

Discussion 6. Assesses the impact of implementing a public information programme.

C. CRITERIA

In order to establish a point of reference for the various areas of impact assessment noted above, it is necessary to delineate the basic criteria used in this assessment. The following criteria have thus been identified:

(a) That there is a need to prevent the hazards of loss of life, damage to property, etc., eminent in the occurrence of a flood.

(b) That the beneficiaries of flood protection bear the costs for that protection rather than the public at large.

(c) That in paying for this flood protection, through the meeting of flood plain building requirements, these individuals are not forced into an economic state that would alter their chosen life style.

(d) That the objectives for each community, as stated by the local residents and the overall city plan, are recognized.

(e) That the integrity of each community as a viable physical and social unit be insured.

DISCUSSION 1. GENERAL SOCIO-ECONOMIC IMPACT ASSESSMENT - THAT PORTION OF THE FLOOD PLAIN ALREADY INTENSIVELY DEVELOPED

This part covers discussions on flood protection, property values in general, potential impacts on residential, commercial and residential uses, and potential impacts on a community as a whole.

A. FLOOD PROTECTION

Flood plain management is essentially a long range flood control programme. It aims at controlling development within the designated flood plain/floodway districts, such that potential damage to property and loss of life are reduced over the long run. As such, the programme offers virtually no immediate flood protection to communities currently existing within these districts.

Over the long run, redevelopment of the flood plain within areas of existing development, would provide flood protection by specifying that any future construction comply with structural requirements which would ensure a reduction in potential damage and loss of life in the event of a major flood. Flood damage estimates would consequently fall as redevelopment occurred over time.

B. PROPERTY VALUES IN GENERAL

In other areas where land use management has been adopted as a major component of a flood control programme, as was the case with Cedar Rapids, Iowa, property devaluation for all forms of land use development appears to have been an initial and temporary reaction to the exposure of the potential flood threat.

Other factors which might contribute to this situation would be:

1. Devaluation as a result of actual flooding. This would occur regardless of the implementation of flood plain management controls.

2. The additional construction costs involved in meeting the proposed building construction specifications.

3. The degree to which inundation occurs. The greater the inundation, the greater the economic cost involved in meeting the proposed building construction specifications.

4. The indiscriminate and rigid application and enforcement of flood plain regulations across all communities.

Such potential property devaluation could, however, be offset over the long run by such factors as the following:

1. The absence of serious flooding in the future.

2. The availability of mortgage money to those wishing to redevelop to flood plain specifications. Our investigation has led us to concur with Montreal Engineering findings that such money will be available. This is, however, assuming that other normal lending circumstances can be met.

3. The rising cost of developable land within Calgary and increased pressure to develop the flood plain.

4. The discriminating application of flood plain guidelines to existing communities, and the relaxation of regulations governing improvements or renovations to existing structures.

C. POTENTIAL IMPACTS ON RESIDENTIAL USES

In addition to the impact comments above, the following impact

observations can be made regarding residential uses:

1. There will be a definite increase in economic costs to residential owners. This, of course, cannot be avoided and it is assumed that the beneficiaries of flood protection pay for that protection.

2. The fact that there is an increase in economic costs to the residential owners is important only in the degree of the economic cost - that point when the necessary costs become a burden.

3. The impact in the short term will be slight. Although most residential structures in the flood plain would not meet the recommended construction standards, these construction standards are not retroactive.

4. However, the long term impacts could, in all probability, be more severe. Increased construction costs resulting from such items as, elevation of living floor, anchorage to resist floatation and lateral movements, water-proofing, relocation of electrical heating and mechanical services, and general construction standards, rigidly enforced, could discourage renovations or improvements of existing housing stock and lead to their gradual deterioration. This statement must, however, be viewed in light of two separate issues.

   First, there are those instances where improvements done, involve house additions, new garages, or significant changes in the structure of that house. Under such circumstances, if the flood plain management is to be effective, it would seem both logical and fair to expect that these additions meet the required construction specifications. The level of economic impact here may involve the discouragement of new housing additions, or garages, particularly in those areas where the level of inundation is high and thus some potential loss to future property value is likely.

   If, on the other hand, what may be termed as normal maintenance in the life of a dwelling, such as roofing repairs, building stabilization, reflooring, etc., fall under more restrictive construction specifications, increased cost might well discourage these improvements and lead to housing deterioration.

5. The degree of this economic impact would further depend on the present physical condition of the dwelling unit - the older the dwelling, the greater the impact.

6. The degree of impact would also depend on the economic status of the owner. The lower his income and financial resources, the greater the impact.

7. The degree of impact relates as well to the type of housing. The overall percentage impact in terms of the total value of the dwelling unit, will generally prove greater for single family units over walk-up apartments and greater for walk-up apartments over high-rise apartments (Under such circumstances, normal first floor functions may include parking, lobby, etc.). If this is the case, then a gradual transition from low to high density development can be anticipated.

8. Where this trend to higher density development can logically and economically occur, this trend will serve to keep residential land values stable to high.

9. Residential land values tend to remain high where in proximity to the river, due to the demand for riverbank property and in spite of increased development costs.

10. It is unlikely that new houses will be developed in existing developed areas in the flood plain because of the additional construction cost incurred, the nature of existing communities, and the size of housing lots available.

D. POTENTIAL IMPACTS ON COMMERCIAL USES

As with housing, increased costs will occur for existing commercial uses within the existing developed area of the floodplain. Again, however it is the degree of increased costs that is important.

Factors governing impacts such as non-retroactive building specification, costs for additions as versus normal maintenance of the facility, the present condition of the building, apply in a similar manner to commercial areas as to residential areas.

In addition, the following factors affecting the degree of impact come into play on commercial uses:

1. The present economic viability of a particular business. Marginal business may prove no longer economical, forcing the owners out of their means of livelihood.

2. The economic viability of the commercial district as a whole. While many businesses within a commercial district may be successful, the deterioration or disappearance of a number of other businesses will tend to reduce the "attractiveness" of the district as a whole.

3. The degree of economic impact on the surrounding residential district will, in turn, affect the "economic market" for the commercial district. The greater this impact on the residences, the greater it will be on the commercial district.

E. POTENTIAL IMPACTS ON INDUSTRIAL USES

Potential impacts on existing industrial uses within the flood plain are similar in nature to those general impacts for housing and commercial land uses already discussed (i.e. degree of increased costs, costs for

additions as versus maintenance of the plant facility, the viability of the present industrial operation, the present condition of the plant facility, etc.) It is sufficient to add here only that if the increased costs force a marginal industry out of business, there is a severe socio-economic hardship placed on both the owners and employees.

F. POTENTIAL IMPACTS ON THE COMMUNITY AS A WHOLE

In addition to impacts on the various aspects of a community, certain impact observations may be made for the community as a whole.

1. The greater the percentage of the community within the flood plain and subsequently under the proposed building specifications, then generally the greater will be the negative impact on the community as an effective physical, social and economic unit.

2. The lower the community is below peak flood levels, then the greater the negative impact.

3. The less economically well-off and viable the community is, then the greater will be the negative impact.

DISCUSSION 2. SOCIO-ECONOMIC IMPACT ASSESSMENT OF SPECIFIC COMMUNITIES EXISTING WITH THE FLOOD PLAIN

This assessment is discussed with reference to each community directly or indirectly affected, with regard to:

(a) Flood Protection
(b) Property Values
(c) River Access
(d) Future Development
(e) Community Integrity

A. BOWNESS

(a) FLOOD PROTECTION:

Some 130 residential units and 9 commercial units will not receive immediate flood protection.

(b) PROPERTY VALUES:

In Bowness, the probability that property values will initially drop upon exposure to flood threat and the implementation of flood plain zoning, is high.

Such devaluation will likely be temporary for properties situated within the flood plain district. Similar devaluation of the five properties located within the proposed floodway, will be permanent. However, the Montreal Engineering Report recognizes this fact,

and recommends the eventual acquisition of these properties as they come into the market.

(c) RIVER ACCESS:

The adoption of flood plain guidelines to control development does not ensure either public ownership or access to the river.

In Bowness, access to the river is severely limited. Private residential ownership along the river has created this situation. The eventual removal of structures from the floodway is the only instance that would alleviate this condition to a limited extent.

However, it is believed that a significant impact of adopting a flood plain management programme will be the intensification of debate and concern respecting public versus private ownership of river frontage in Bowness.

(d) FUTURE DEVELOPMENT:

1. In the absence of a community plan for future development of Bowness, the adoption of flood plain management could intensify conflict between the city and the community, respecting the future of the community and its relationship to the river.

2. The rigid enforcement of flood plain regulations governing construction could discourage improvement, renovation, or redevelopment of properties lying within the flood plain.

   Most of the structures in the flood plain exist more than 2½' below the maximum flood line. New structures would have to be elevated from between 4' to 8', in order to meet the elevation standards recommended by Montreal Engineering. In most cases, the additional construction costs of building to this specification, as well as those involved in meeting the other proposed requirements, could prove to be prohibitive to individual property owners with extensive building revisions, and new single-family residential development.

   This situation would prove to be more conducive to the development of higher density, multi-family structures which could utilize the first level for parking.

(e) COMMUNITY INTEGRITY

The short term impact of implementing flood plain management on the integrity of that portion of Bowness situated in the flood plain, would appear to be slight. While most of the structures within the flood plain, and particularly within the residential neighbourhoods, would not meet the construction standards recommended in the Montreal Engineering Report, the authors have recognized the political and economic infeasibility of requiring these properties to retroactively

conform and consequently have recommended that only future development be subject to the flood control regulations.

With the exception of a number of small commercial establishments on Bowness Road, there is no development other than residential within the flood plain.

The possible gradual transition of residential neighbourhoods, from low to medium density would somewhat change the fabric of the community. Whether, in the long run, such potential changes would be viewed as being positive or negative is a matter of speculation. However, in the Bowness area where the nature of the community/river interface has traditionally been one of private waterfront ownership and access, this type of change would in all likelihood be unwelcome to many property holders.

As all major commercial facilities and community amenities such as schools, libraries, shopping centres, hotels, etc., are outside the proposed flood plain, the implementation of flood plain management would have a negligible effect on this aspect of Bowness community. The one exception to this would be the designation of the Bow Crest Nursing Home (just recently expanded) on Bowness Road, as a non-conforming use.

The Montreal Engineering report recommends that such institutions not be permitted within the flood plain area. The report refers to places of assembly for the mentally or physically handicapped, senior citizens or nursing homes, places of incarceration, and schools.

B. MONTGOMERY

(a) FLOOD PROTECTION:

No immediate flood protection is offered for the some 55 residences and commercial properties in the flood plain.

(b) PROPERTY VALUES:

Property value will likely drop as an initial reaction to flood plain zoning. However, this situation should be temporary.

The major parcels affected will be:

1. Bow Bend Trailer Court
2. Bow View Nursing Home

1. Bow Bend Trailer Court: The Montreal Engineering Report recommends the removal of trailer courts existing within the floodway district at the earliest possible date. The short term impact would, therefore, be the displacement of some families and the devaluation of the existing property.

   Any programme to remove this use from the floodway, should be accompanied by a programme of compensation to the property owner, and assistance in relocation for the families affected.

2. Bow View Nursing Home: The impact of requiring an alternative use for this structure would be the displacement of the current residents and possible interim economic loss to the property owners. Implementation of this recommendation should carry with it a programme of compensation and assistance in relocation.

(c) RIVER ACCESS:

Because a major portion of the Montgomery area lying within the flood plain is publicly owned, and is either developed or slated to be developed for recreation, the impact of adopting flood plain regulations for this area will be positive. The restriction of structural development within the floodway will assure public access to the river.

(d) FUTURE DEVELOPMENT:

Rigid enforcement of flood plain regulation governing development of properties could discourage improvement, renovation, or redevelopment of some of the existing residential properties within the flood plain, and specifically, those properties on the river edge east of the Bow Bend Trailer Court. The proposed guidelines would require these properties to be elevated between 5' to 8' in the event of redevelopment.

Other proposed residential or commercial developments within the Montgomery flood plain on private property, would be required to be elevated between 1 to 3'. It is believed that construction to flood plain specification in this instance would not prove to be as economically prohibitive, especially when planned on an over-all large scale.

(e) COMMUNITY INTEGRITY:

Because the major residential, commercial and institutional areas of Montgomery lie outside the flood plain district, and because the current use of public land within the flood plain would conform to the guidelines proposed, it is believed that the adoption of statutory guidelines to control future development within Montgomery would have no serious negative impact on the long term integrity of the community. The potential provision of river access and river-related recreational amenities to both Montgomery and Bowness, should be viewed as a positive impact of adopting flood plain guidelines.

C. HILLHURST-SUNNYSIDE

(a) FLOOD PROTECTION:

Flood plain management offers no immediate protection to the some 1200 residential units and 30 commercial properties existing in the flood plains.

Over the long run, control of development to required specifications would ensure minimal damage to property, and therefore lessen the economic burden of recovery from flooding to both the property owner and the public as a whole. While the land use management technique thus affords minimal flood control, it does, over time, provide flood protection to residents of the flood plain without significant cost to the public. The cost of flood protection is borne by the property owner at the time of development.

(b) PROPERTY VALUES:

While some initial devaluation of property may occur in this community as a result of flood plain zoning, it is unlikely that the situation would endure.

The proximity of this community to the core and the increasing scarcity of developable land in the central area, will ensure the redevelopment of this area and the continuation of an increase in land values over time.

(c) RIVER ACCESS:

Public access to the river presently spans the entire reach of the river associated with the Hillhurst-Sunnyside community.

The adoption of flood plain guidelines would do little to alter this situation other than to assure that no structural development will occur within the floodway district in the future. Access to Prince's Island is provided by a footbridge spanning the major channel of the Bow River.

(d) FUTURE DEVELOPMENT:

In the absence of a community "district plan" for the area, the adoption of statutory guidelines governing future development within the community, could intensify conflict between the city and the community over the future of the area.

The community is currently pursuing the development of a district plan and has released a document which states the need for such a plan. (i.e. "The Need for a Community Plan", submitted to Alderman John Kushner by D. Wallace, President, Hillhurst-Sunnyside Community Association, July 17, 1973.)

There are no commercial, industrial, institutional, or residential structures which would be affected by the implementation of a floodway district along this community. Memorial Park, situated on the south side of Memorial Drive between it and the river, would be an appropriate and conforming use.

Rigid enforcement of the proposed flood plain guidelines could well discourage improvement and renovation of existing properties. This is particularly true for the Sunnyside area.

Hillhurst Area of Community

The entire portion of Hillhurst-Sunnyside, between 17th Street, N.W., and 8th Street, N.W., lying within the recommended flood plain district, is only 2½' or less below the maximum projected flood level (range 6" to 2½').

Improvements and renovations to existing structure, in accordance with proposed flood plain specification, could prove to be economically prohibitive in some instances, given the economic status of residential property owners.

Construction costs and difficulties encountered in redeveloping properties, over the long run, to meet elevation, anchorage, water-proofing requirements, etc., would be less severe than in Bowness or Inglewood where much of the developed land lies well below the maximum flood level.

However, the combination of additional construction costs and the economic status of this area, would tend to discourage the redevelopment of properties as low density and encourage the development of medium to high density structures which could utilize first floor area for parking facilities.

Sunnyside Area of Community

The entire Sunnyside area of community lies within the proposed flood plain district and almost all of this land lies well below the maximum project flood level (range 3' to 7' approximately).

Improvements, renovations, or redevelopment of low density dwellings within this area to specified requirements would, in most cases, prove to be economically difficult.

This situation, in conjunction with current zoning of the area as R_4, would tend to favour redevelopment in the form of medium to high density structures; a trend which has been occurring even in the absence of flood plain controls.

(e) COMMUNITY INTEGRITY:

As existing structures within the flood plain would not, according to the Bow River Report, be required to conform to flood plain guidelines, the short term impact on the integrity of the community would be slight.

The Hillhurst-Sunnyside Community is a residential area in transition. The major impact of implementing flood plain regulations would be to speed up this process of transition.

Increased construction costs of building to specified standards can only encourage the eventual transition of the community from a low/medium density population, to a high density inner city area.

This situation is compounded by the fact that many of the existing home owners cannot afford to carry out major improvements or additions to their homes, even in the absence of flood plain guidelines. Certainly the additional expense in meeting the proposed specifications would tend to create, at the minimum, a status-quo in the level of present housing, and in certain instances, a deterioration of the housing stock and its replacement with multi-family dwellings.

The potential impact of flood plain management upon commercial and industrial enterprises within the Hillhurst-Sunnyside flood plain, would be similar to impacts on residential development. Short term impact would be felt by those wishing to modify, expand, make major renovations to existing structures. Any such construction would have to comply with the structural specifications outlined in the report.

Any new commercial/industrial development would also have to conform, thus reducing potential flood damage to property over the long run. Stockpiling and storage of materials or equipment, which could float away in the event of a flood, would be prohibited. Enterprises which depended upon such activities for ongoing operations would be discouraged from establishing themselves within the flood plain, and thus potentially preventing a cluttered community image.

Improvement, expansion, or redevelopment of commercial properties, presently concentrated along 10th Street, N.W., 14th Street, N.W., and Kensington Road, would be subject to the proposed structural standards.

It is believed that the additional costs involved in such development would not pose excessive economic hardship, except in the case of smaller, older retail enterprises (i.e. neighbourhood corner stores), operating on a minimal profit margin.

The loss of these establishments would alter the character (social and physical) of the neighbourhood and the fabric of the community.

Alteration of the scale of the commercial environment which is currently pedestrian-oriented and the depersonalization of the shopping activity as a result of the replacement of small neighbourhood stores with larger complexes, could constitute negative impacts in terms of community integrity.

The majority of the Hillhurst-Sunnyside Community lies within the proposed flood plain district. The implementation of the recommendation which prohibits the construction of "institutions or places of assembly, posing evacuation problems", could have serious consequences in terms of the long term stability of the community as a residential area. Day care centres, schools, nursing homes, senior citizen homes, etc., could not be developed.

Given that this area is in a state of transition tending toward higher density development, the need for these social facilities and community amenities, should be apparent. Inability to provide them resulting from the adoption of flood plain management guidelines, could have significant negative impact on the future of the community.

Therefore, rather than a "blanket" approach being taken regarding the eventual removal of all institutions from the flood plain, it is suggested that individual institutions be examined as to potential means of remaining and still meeting flood plain management concerns. This specific situation examination should not be considered as unjust merely because it does not apply to all institutions in the flood plain, equally. Institutions must be regarded as a community function as versus private ownership.

D. INGLEWOOD

(a) FLOOD PROTECTION:

In short term, there is no flood protection for the some 590 residential and 60 commercial structures in the flood plain, which constitute the major portion of the community.

In the event that redevelopment is carried out in accordance with the recommended flood plain regulations, flood protection to property and a reduction in potential damage estimates will occur over time. However, in the event that this is not the case, this community, almost in its entirety, will continue to be subject to extensive flood damage in the event of a major flood.

(b) PROPERTY VALUES:

It is believed that the same factors cited in the Bowness section could influence property values in the Inglewood-Ramsay Community. However, if the flood plain recommendations were to be implemented, and as they affect almost the entire community, they would virtually freeze the community's present trend of revitalization, thus putting the area's potential future development in doubt. The result of this would be an inevitable deterioration of the community, physically and socially. Consequently, property values would invariably decrease.

(c) RIVER ACCESS:

Although adoption of statutory guidelines to control development within the flood plain does not, in itself, insure public ownership of, or access to, property immediately bordering the river, the implementation of the flood plain management would, in the long term, be of a positive nature. Much of the riverbank land within Inglewood is at present publicly owned or being acquired for public ownership. There is, however, some private property between approximately 13th Street and 15th Street, S.E., along New Street. The implementation of the flood plain recommendations would intensify the concern and debate over private versus public access.

Even if the flood plain recommendations were to be implemented, public access to the river would be further impeded by industrial concerns situated on the west and south extremities of the Pearce Estate.

(d) FUTURE DEVELOPMENT:

Rigid implementation of the flood plain recommendations would have a significant impact upon the redevelopment of Inglewood-Ramsay. The properties within the area bordered to the west by 14th Street, S.E., to the east by the Bow River, to the north by the Bow River, and to the south by 10th Avenue, S.E., would be greatly affected. New structures being built within this area would have to be constructed in such a manner that the first floor of habitation or use, be at a maximum of 8' above existing ground level.

This ruling is inconsistent with Inglewood's Design Brief. In its brief, the community states that proposed construction of new 3 or 4-storey apartments be commensurated in height with the height of existing structures on 9th Avenue. However, the required maximum of 8' would cause the proposed structures to be either higher than those now existing on 9th Avenue, or would prohibit the development of apartments to a 3 or 4-storey standard, thus reducing potential housing stock, and hence retard the attainment of the desired population increase expressed in the brief.

Furthermore, rehabilitation and redevelopment of existing housing stock in this area would be restricted. Given the age and structural characteristics of the existing dwellings, plus the economic characteristics of the residents, it would prove economically infeasible to renovate these structures according to Montreal Engineering's suggested structural guidelines. This is inconsistent with the community's city-approved design brief, which states as one of its objectives, the retention and improvement of existing housing stock.

The suggested structural requirements would also negatively affect certain elements of the proposed commercial redevelopment in the area. This would be particularly true for many of the existing commercial concerns, which reflect the current social and physical character of the community. Few of these establishments could afford the costs which would be incurred in structural renovations concurrent with the suggested structural guidelines. This financial inability could result in their replacement by larger business concerns, although the costs of new commercial development as versus the economic level of the community would tend to discourage any new development.

Such trends would be inconsistent with the design brief's intention to create a more personalized and complete community.

In the remaining area of the community, that section bordered to the west by 8th Street, S.E., to the north by the Bow River, to the east by 14th Street, S.E., and to the south by 17th Avenue, S.E., approximately, which is within the designated flood plain, newly developed structures would have to be built with an increased elevation of 2½' to 3' built above the existing ground level. The same effects as mentioned above, although not as economically severe, would occur here with regard to proposed and existing structures.

Rigid implementation of the flood plain proposals would also greatly restrict the future development of expanded education facilities, senior citizen centres, and residences, medical facilities, and cultural centres. These services would, according to flood plain management, be prohibited from locating anywhere within the flood plain zone. This is because they could pose special problems, should evacuation be required in the event of a serious flood with little or no warning.

Such a proposal, if implemented, would thus prohibit the development of a senior citizen centre and residences along the riverbank, or medical facilities and education facilities north of 9th Avenue. These facilities, if they were to be still offered in the event of implementation of such a proposal, would be forced to locate some distance south of 9th Avenue. Such location is questionable, however. There is the problem of existing developable land. There is also the factor that the relocation of these developments away from the more easily accessible areas of the community would not allow them to be effectively incorporated into the community's life pattern, as hoped for within the design brief, nor utilized to their full capacity or to the full need of the community.

(e) COMMUNITY INTEGRITY:

The implementation of the proposed flood plain recommendations upon the Inglewood-Ramsay area would have a serious negative impact upon the community. As the majority of the community lies within the flood plain area, future rehabilitation and redevelopment would be greatly curtailed. Such curtailment would effectively freeze the community's desire to enter a stage of rebuilding and virtually undue its past four years of planning initiative work.

Furthermore, as this community has helped generate a trend toward responsible community participation in planning throughout the city, such a negative impact could have severe detrimental effects upon such participation elsewhere in the city (i.e. Hillhurst-Sunnyside).

E. BRIDGELAND

(a) FLOOD PROTECTION:

As is the case with other existing communities, the flood plain management programme offers no immediate flood protection to the 150 residences in the Bridgeland flood plain.

This raises some serious concerns with respect to Bridgeland as a portion of the Canadian Institute for the Blind, the Lions Club, and the Rehabilitation Society, all lie within the proposed flood plain district. The elevation of the Metropolitan Calgary Foundation Senior Citizen Home, which has approximately 150 residents, is also dangerously close to the projected maximum flood level (range 6" to 1').

(b) PROPERTY VALUES:

Much of the property lying within the Bridgeland flood plain is currently publicly owned. Privately owned properties consisting of approximately 100 older residential structures and several commercial structures will, in all likelihood, be redeveloped to higher density structures in the not too distant future.

The proximity of this area to the core, in conjunction with the apparent need for improvement or redevelopment, should offset any initial property devaluation which results from flood plain zoning.

(c) RIVER ACCESS:

Access to the water's edge along the south side of Memorial Drive is continuous along this reach of the river. The adoption of flood plain management controls should not alter this situation.

(d) FUTURE DEVELOPMENT:

With the exception of an 11-acre parcel situated east of the Edmonton Trail and south of Meredith Road, the remaining 88 acres of proposed flood plain is less than 2½' below the projected high water level. Redevelopment to flood plain standards within this area would not pose excessive economic hardship on prospective developers.

(e) COMMUNITY INTEGRITY:

As the major residential/commercial areas of Bridgeland lie outside the proposed flood plain district, the impact of adopting flood plain controls on the community as a whole, should be minimal.

However, the impact upon existing residential property owners with the flood plain, could be substantial. Improvement and renovating existing housing would be financially taxing on the existing residents, even in the absence of flood plain regulations.

The enforcement of the proposed standards would, in fact, further discourage improvements and consequently increase the rate of neighbourhood deterioration.

The fact that several of the communities' institutions lying within the flood plain would become non-conforming uses in the event of flood plain zoning (i.e. The Rehabilitation Society, C.N.I.B.), could also alter the social character of the community.

F. DOWNTOWN EAST

(a) FLOOD PROTECTION:

Flood plain management provides no immediate protection for this area.

The area concerned incorporates Chinatown and the area previously designated for redevelopment under the 1A Urban Renewal programme.

(b) PROPERTY VALUES:

The adoption of flood plain zoning should not have significant negative impact on property values in this area.

(c) RIVER ACCESS:

The adoption of flood plain management does not insure public access along this particular reach of the river.

At the present time, access is severely limited by parking lots and older - in many instances - dilapidated structures which back onto the river.

The restrictions of structural development within the rather narrow floodway zone along this part of the river, may alleviate this situation slightly. However, public access could only be assured if river front parcels were publicly owned.

(d) FUTURE DEVELOPMENT:

Approximately 110 acres of the total 140 acres located within the proposed flood plain district, lie 2½' plus, below the potential high water level. Most of the existing residential and development areas lie within this district, particularly the major portion of Chinatown.

Major improvement or redevelopment of these properties to flood plain standards by existing residents, would prove to be infeasible. New structures would have to be elevated up to 3'.

If the area formerly designated for urban renewal were to continue to be developed for uses such as those constructed to date (i.e. Y.W.C.A., Catholic School Board building, Public School Board building, public library, etc.) the additional cost of developing to flood plain specifications would not appear to be a significant deterrent to future urban growth in this area.

Any revitalization or redevelopment of Chinatown as a residential, ethnic and commercial area, could be severely hampered by the imposition of flood plain controls. Given the economic status of the neighbourhood, the likelihood that residents could afford to comply with flood plain regulations, is small.

New development to the specified standards would inevitably erode the social and physical flavour of the area and lead to the eventual deterioration of the social fabric of this ethnic community.

G. EAU CLAIRE

(a) FLOOD PROTECTION:

The land management programme recommended within the Bow River Study, does not provide any protection for the Eau Claire area in the

short term. In the long term, however, the flood plain management will undoubtedly provide significant protection for this section of the city.

(b) PROPERTY VALUE:

It is doubtful that the flood plain management will have any detrimental effects upon the value of property in this area. The proximity of the area to the major activity sites of the city core (i.e. the Central Business District, financial centres) and the increasing shortage of easily developable land possessing such a high degree of access to downtown Calgary, are certain to maintain and increase existing property values.

(c) RIVER ACCESS:

The adoption of flood plain management guidelines does not, in itself, insure public ownership of, or access to, river front properties. However, in this area, it appears that such an adoption could be utilized to provide public access to the riverbank. The proposed extension of a pedestrian mall along 3rd Street, S.W., connecting Prince's Island with the 8th Avenue mall, would demand that certain areas of the riverbank south of Prince's Island be maintained as publicly accessible land. Furthermore, if this proposed mall is to be implemented, it could generate as a result of its carrying capacity, a demand for expanded open space to accommodate an increase of users.

The recent stipulation placed by the city upon the Eau Claire Estate's proposed development to the immediate southwest of Prince's Island, seems to indicate that it will be the city's policy to implement an expansion of open public space. For, in the development of Eau Claire Estates, the city has demanded a 200-foot wide right-of-way between the development's northerly edge and the riverbank be used as park.

(d) FUTURE DEVELOPMENT:

Any future development within this area would be potentially affected by the implementation of the proposed recommendations. This is especially true for that section bounded to the west by 4th Street, S.W., to the north by the Bow River, to the east by Centre Street, and to the south by 3rd Avenue, S.W. In this section, the first floors of new structures would have to be situated 5' to 8' above the existing ground level.

Such a requirement could affect the future design fabric of the area. It would increase the cost of construction, and thus encourage the developer to attempt to use the land to a high intensity in order that he may obtain a safe profit. This would consequently encourage people to build such structures as high density high-rises; or low rise, medium density structures.

This type of development could pose some problems however. It would retard the visual access from the downtown area to the river

escarpment, contrary to the suggestion outlined in the city's 1964 plan for Downtown Calgary, that such a visual connection be maintained and cultivated.

The remaining part of the area, bounded to the north by the Bow River, to the south by 3rd Avenue, S.W., to the east by 4th Street, and to the west by 7th Street, will not be affected as seriously. The first floor of new buildings will only have to be built to a maximum elevation of 2½' to 3' above the existing ground level. Consequently, construction costs will not be increased to the extent they might in the other area. Hence, this area could readily be developed into low rise, medium density dwelling structures.

(e) COMMUNITY INTEGRITY

As the existing community is in a state of decline, the implementation of flood plain management recommendations would have little effect upon present community integrity. In fact, as the recommendations would stimulate new types of physical development, catering to a different spectrum of people than those which presently characterize much of the area, the flood plain recommendations could help give rise to a new and more viable social structure.

H. PARKDALE AND WEST HILLHURST

Neither the Parkdale Community as a whole, or the West Hillhurst Community as a whole, would be significantly affected by the adoption of flood plain guidelines. Only a small percentage of each community lies within the flood plain area.

Potential impact would be limited to a small number of residential properties and undeveloped land.

(a) Parkdale

In Parkdale, some 33 residential structures lie within the flood plain. While any future improvement, renovation, or redevelopment of these properties would be required to conform to specified standards, the additional costs involved in meeting such regulations would not appear to be excessive. With a few exceptions, the properties in question are only 6" to 1' below the projected maximum flood level. Consequently, redevelopment would seem to pose little difficulty.

Flood plain management does not reduce the immediate flood threat to these residences. Therefore, temporary property devaluation could result upon exposure of the flood hazard.

The parcel of undeveloped land bounded on the east by 37th Street, N.W., on the north by 3rd Avenue, N.W., and on the south and west by the Bow River, is, with the exception of approximately 10 acres, less

than 2' below the maximum flood level. A portion of this parcel is currently being utilized as a drive-in theatre.

Future development of the area to flood plain specifications, would not appear to pose any great difficulty.

(b) West Hillhurst

Approximately 45 residential structures in this community lie within the flood plain.

Because of the potential flood threat to these structures, temporary property devaluation could result as a reaction to flood plain zoning.

I. WILDWOOD & SPRUCECLIFFE/Ogden-Millican

The potential impact of adopting flood plain management controls upon these communities would be of a more indirect nature than for those previously mentioned.

While the communities in question are found adjacent to the river, they do not lie within the proposed flood plain district.

The major impacts would be felt in terms of the recreational and aesthetic implications of adopting flood plain management controls.

The impact of flood plain management upon the future state of Edworthy Park and Lowery Gardens, would be of primary concern to residents of both Wildwood and Sprucecliffe.

The potential impact of flood plain management upon the flood plain/floodway districts at the foot of the Ogden-Millican Estates development, would not concern residents of this community.

The selective removal of vegetation from the floodway and river gravel bars and the removal of dead vegetation from the flood plain, could have both short and long term impacts on these areas, both in terms of their recreational and aesthetic value.

DISCUSSION 3. GENERAL SOCIO-ECONOMIC IMPACT ASSESSMENT - POTENTIAL NEW DEVELOPMENT AND COMMUNITIES WITHIN THAT PORTION OF THE FLOOD PLAIN NOT INTENSIVELY DEVELOPED

It has been noted in the Montreal Engineering Study that of the total flood plain area of 5,278 acres, some 4,156 acres (or approximately 79%), is in one form of open space or another. According to the Calgary General Plan, a majority of the area is designated for potential industrial growth with one large area designated as future community.

To this extent, the following general impact observations may be made:

1. The long term potential economic savings resulting from implementation of flood plain management controls, will result in considerable savings through the prevention of loss of life, damage to property, etc., when a flood occurs.

2. There will be, as a result of these building control specifications, an increased cost to new development, the impact relating to the degree of cost being incurred.

3. The degree of impact for new developments, when related to the city as a whole, is difficult to determine. The total city market and changes in that market, the availability of economically serviceable land existing elsewhere in this city, etc., all affect new developments in the flood plain to one extent or another, and may serve to increase or decrease the economic impact of the flood plain management requirements.

4. The degree of impact will vary according to the type of development. Generally, it will be less for commercial/industrial areas than for housing and less for high-rise housing over single family housing. It is assumed that the additional costs incurred will represent a less significant portion of the total cost of, say a high-rise apartment as versus a townhouse.

5. The greater the degree of inundation, then the greater the economic costs incurred in flood protection and the greater the impact. It should be noted that a large portion of the land in question is 2½' or more below expected peak flood level.

6. The degree of impact should be generally less for larger scale developments than for individual property, or for small scale developments that are part of an overall plan for a larger area. Assumed is the condition that planning larger areas of the flood plain can allow for a more clear and efficient development. In this regard, it should be noted that the City of Calgary does not allow development to proceed without an approved design plan for any particular development area or community. Further, a major portion of the area is already in larger land holdings.

7. According to the City of Calgary Master Plan, only one area along the southern reach of the Bow River is zoned for future residential use. This designated area is to be jointly developed by New-West Development

Corporation and Imperial Oil Limited. The land designated as floodway within this development, has already been dedicated to the city as community reserve.

The only remaining area which could be made available for residential development is the area south of Anderson Road, bounded on the east side by the Bow River and on the west side by the Blackfoot Trail. This area is currently under policy review by the city.

8. Because the area designated as floodway along the reach of the river in the southeast is significantly greater than it is along the currently developed portion, potential for increased open space is indeed great. Because structural development in the floodway is prohibited, the provision for open space within the city would be insured in the long run. However, there can be little doubt that any use of the floodway district for transportation facilities or private usage, would seriously restrict public access and discourage river usage.

DISCUSSION 4. IMPACT OF LIMITED ENGINEERING WORKS

A. PRINCIPAL IMPROVEMENTS

1. Crematorium Hill Area

The major recommendations calling for bank stabilization and channel widening have already been implemented. The impact of these engineering works on the adjacent community (Bowness) are cited in the section of this report dealing with "Public Response".

2. Crowchild Bridge Area

The removal of a constriction at this point and the rip-rapping of a portion of the southern bank would influence the visual and aesthetic quality of the river across from the Westmount Community.

3. Langevin Bridge Area

Works undertaken in this area would have relatively little impact on existing communities so long as appropriate landscaping accompanied the engineering works.

The works would require the removal of a number of trees, and portions of a recently city developed river pathway. Replacement of these amenity factors should accompany the implementation of engineering works in this area.

4. St. George's Island

The impact of implementing the engineering recommendations within this area would be felt most directly by property owners adjacent to the river in the Inglewood area. Removal of land fill on the southern tip of St. George's Island, involving the removal of major trees and

vegetation cover, would have a negative visual impact on such property privately owned.

The removal of fill and provision of rip-rapping on the south bank of the river opposite St. George's Island, could have similar implications.

The main benefits to property owners of carrying out such works, would be reduced bank erosion. However, it is believed that the issue of private versus public ownership and access would play a significant role in determining the reaction of the residents to the proposed recommendations. Consequently, this issue would have to be resolved prior to undertaking any engineering works in this area.

5. Cushing Bridge Area

The impact of carrying out proposed engineering recommendations for this area would primarily be of a visual and aesthetic quality. Direct community impact would be negligible, as access to the area is currently restricted by a mesh fence and usage is of an informal nature.

B. REMOVAL OF GRAVEL BARS, AND VEGETATIVE COVER

The recommended selective removal of gravel bars and brush cover along the 24-mile reach, aimed at improving the hydraulic efficiency of the river and reducing erosion, would affect communities indirectly by altering the visual quality of the river and its potential for recreational usage.

C. GENERAL IMPACTS ON COMMUNITIES

In the main, the major negative impacts of implementing the proposed engineering recommendations on riverside communities would be indirect, and would take the form of a possible reduction in the visual and recreational value of specific areas of the river, and a potential alteration in the nature of community/river relationship. The major benefits to riverside communities would be as follows:

(a) a slight reduction of the potential flood hazard.
(b) a reduction in the total area of the potential flood plain.

In the event that the engineering recommendations are not carried out, the area which would be inundated in the event of a major flood, would be greater than that currently designated by the Montreal Engineering Report on flood plain. The district boundaries would have to be altered to include these areas.

DISCUSSION 5. IMPACT OF ESTABLISHING A FLOOD FORECASTING CENTRE

The establishment of a computerized early warning flood forecasting centre would constitute one of the more positive aspects of the recommended flood control programme.

Reduction of potential property damage and danger to life through early flood warning would be achieved.

DISCUSSION 6. IMPACT OF A PUBLIC INFORMATION PROGRAMME

The implementation of the recommendation to establish a public information programme has, in part, been achieved.

Information respecting the potential flood hazard and the proposed flood control programme, has been distributed to both flood plain residents and the public at large.

The impact of this programme in terms of community reaction will be discussed at length in part II of the Impact Statement dealing with the Public Response. The implementation of a programme aimed at informing the public on precautionary measures which can be taken to alleviate potential damage in the event of a major flood, should be proceeded with at the earliest possible date.

D. CONCLUSIONS AND RECOMMENDATIONS

1. The proposed flood plain management plan provides no immediate flood protection to communities currently existing within the flood plain. It does, however, offer both protection and a reduction in potential property damage over time as a direct result of redevelopment to meet flood plain specifications.

2. While property values may intially decrease in some communities upon public identification of the flood threat, the implementation of flood plain management is not likely to have significant long term adverst effects.

3. In the absence of a definite proposal for the provision of public access to riverbank areas, the adoption of flood plain management does not inherently permit public access to the river in existing communities. However, the potential for river banks access is increased in undeveloped portions of the city and measures should be employed to ensure this access.

4. The adoption of flood plain management will result in increased construction costs due to special building standards, for any future development occuring within flood plain communities.

   Future development would logically tend toward medium to high density structures or toward large scale projects where this increased cost may be minimized. Future development would appear to be less likely in low lying, economically depressed communities.

5. The impact of adopting flood plain management upon the structure of existing communities will vary across the city. Those with the lowest economic base also have the largest percentage of the community, as a whole, lying within the flood plain. The potential impact would appear to be most severe for Inglewood and Chinatown. Some adverse impacts can also be anticipated for Hillhurst-Sunnyside and Bridgeland.

Consequently, there is a definite need to re-examine the flood plain management proposals in terms of their applicability to these communities given the objectives of the community and their ability to realize these objectives. Dyking in the Inglewood area may, for example, be a more practicable local solution which would still allow development if proceeded in accordance with established plans.

6. The drafting of any by-law to regulate flood plain construction should recognize the individual property owner's need and ability to undertake improvements or renovations of existing structures in harmony with the normal maintenance life of the building.

7. There is a need to establish a public information programme to explain in detail the flood plain management building regulations and their implications as expressed in by-law form.

8. In order to preserve the social fabric of existing communities it is recommended that a re-examination of community institutions in the flood plain be undertaken on an individual basis to determine how they may safely and economically exist in compliance with flood plain management objectives.

SECTION 3. A VISUAL ANALYSIS AND IMPACT ASSESSMENT

A. PURPOSE

B. THE ELEMENTS OF VISUAL ANALYSIS - A METHODOLOGY

C. ANALYSIS OF VISUAL RIVER ZONES

ZONE ONE: 85th Street Bridge to the Shouldice Bridge

ZONE TWO: Shouldice Bridge to Crowchild Bridge

ZONE THREE: Crowchild Bridge to the Elbow River

ZONE FOUR: Elbow River to C.N.R. Bridge

ZONE FIVE: C.N.R. Bridge to Maple Ridge

ZONE SIX: Maple Ridge/Barlow Sector to Fish Creek

D. CRITERIA FOR EVALUATING THE IMPACT OF THE BOW RIVER FLOOD STUDY ON THE VISUAL CHARACTER OF THE BOW RIVER

E. THE IMPACT OF THE FLOOD PROGRAMME RECOMMENDATIONS ON VISUAL RESOURCES

1. The Impact of Flood Channel Improvements.
2. The Impact of the Flood Plain Management Program.
3. The Impact of Other Measures.

F. RECOMMENDATIONS AND CONCLUSIONS

A VISUAL ANALYSIS AND IMPACT ASSESSMENT

SECTION 3

PART THREE: A VISUAL ANALYSIS AND IMPACT ASSESSMENT

A. PURPOSE

A visual resource such as a river valley is important to a city for both functional and aesthetic reasons since it gives a sense of structure and adds visual amenity.

Perceivable structure is required in an environment for people to understand, appreciate, and function within that environment. A river valley supplies such a sense of structure while also furnishing a potential for a welcome natural relief to the harsh artificial urban scene.

Calgary is fortunate enough to be blessed with a number of natural elements which can provide this structure and aesthetic amenity. As has been stated in the Calgary Plan (1970),

> The valleys of the Bow and Elbow Rivers, the area around Glenmore Reservoir, the escarpments on the North Hill, Nose Creek and Fish Creek, present unique opportunities for the City to develop open spaces in such a way that these become greenways throughout the city.

It is essential that any major projects or programmes which might affect these amenities be examined carefully to determine the exact nature and magnitude of the impacts.

B. THE ELEMENTS OF VISUAL ANALYSIS - A METHODOLOGY

Kelvin Lynch has developed conceptual elements useful for such an analysis. These are paths or routes, site districts or zones, edges or transition zones, nodes or intersections, and focal points or landmarks. Such elements help clarify structure. Many vehicular and non vehicular paths relate to the river or utilize the river itself. Edges, powerful determinates of image and structure, occur where water meets land, valley bottom meets escarpment, forest meets field or gravel bar, and developed area meets natural or pastoral area. Nodes, or intersections, occur in a number of locations. Both serve as useful orientation devices within the city. It is, however, the zones that provide the most useful tool for the overall understanding the visual resource in terms of image and character as well as visual structure.

The basic methodology which thus emerges for the analysis of the river resource and the impact of the measures recommended for it involves the following:

1. Describe the river-river valley's general image and structure in terms of coherent visual zones defined by land form and land use, and identify the positive elements which add to its value as well as the negative elements which detract from it.

2. Determine criteria for the preservation and accentuation of the positive features and elements and the rehabilitation or screening of the negative.

3. Evaluate the potential impact of the recommended projects and programmes relative to the enhancement or reduction of the value of the resource.

C. AN ANALYSIS OF VISUAL RIVER ZONES

The visual resources of the Bow River can be grouped into a series of zones defined by vegetation, land form, and land use. These zones give an overall picture of the existing and potential character and function of the river through the city, the amenity areas to be preserved or enhanced and the problem areas to be corrected.

For the Bow River, these zones are defined as follows:

ZONE ONE: 85th STREET BRIDGE TO THE SHOULDICE BRIDGE:

Here the grass-covered, undeveloped escarpment of the north bank dominates. Besides Bowness Park, there are also a number of natural-appearing banks and islands. Even the residential properties on the south bank generally have a greenbelt of mature trees along the river. Significant eyesores exist in the form of a disrupted gravel mining area with polluted lagoons, and the bare gravel armoured, monotonously regular stabalized slide area of Crematorium Hill, the worst eyesore of the river.

ZONE TWO: SHOULDICE BRIDGE TO CROWCHILD BRIDGE:

In this zone, the attractive south bank is in contrast to a generally unkempt north bank. The former is dominated by a dense, mature, largely coniferous forest, including the only significant stand of Douglas fir this far east. It is an undeveloped, generally natural area with the only questionable elements being the railroad line, the landfill area in Lowery Gardens, and an active slide area below Spruce Cliff. On the north bank the land is, for the most part, unattractive vacant land with little major vegetation except for some limited areas of

trees on the banks. The trailer park near the Trans-Canada Bridge is fairly well screened from the river by vegetation, but an unsightly drive-in movie screen is not. Shouldice Park is the only significant visual amenity on this bank. Throughout this zone, gravel bars are apparant and, in one case, serve as an attraction to a large group of gulls which add much visual interest.

ZONE THREE: CROWCHILD BRIDGE TO THE ELBOW RIVER:

This is the Downtown zone of the river. The dominant visual elements are the high rise buildings of the Downtown core, including the major landmark of the Calgary Tower. Although the attractive features of Prince's Island and Memorial Drive Park are found in this zone, the river is mainly characterized by ugly rip rapped banks, junk, materials storage, car lots, warehouses, land fill, railroad lines, roadways, and the like. Potentially positive features are, in some cases, either neglected, such as Chinatown, or subjected to grossly inappropriate use, such as the junkyard at Fort Calgary. With the exception of the park areas on the island, the north bank, and the group of large trees near the Crowchild Bridge, vegetation of any kind is lacking.

ZONE FOUR: ELBOW RIVER TO C.N.R. BRIDGE:

In this zone there is a contrast between industrial, residential, and open space use. The river flows through a low, flat flood plain with a minor escarpment to the northeast. The banks are occupied both by some of the most interesting and attractive green spaces in the city, including the Inglewood Bird Sanctuary and the Calgary Zoo and by some of the most unsightly industrial sites and railroad yards. The river itself is crossed by numerous bridges of all types, mostly unattractive ones. Much of the land is vacant but unkempt. The river is crossed by numerous bridges of all types and by the crumbling Western Irrigation District Weir.

ZONE FIVE: C.N.R. BRIDGE TO MAPLE RIDGE:

This zone (extending approximately down to 114th avenue, southeast), is characterized by a conflict between gravel mining and natural/pastoral open space use. The escarpments again dominate as the river valley narrows. The river channel itself takes on less definite character than upstream reaches as it meanders with some secondary channels forming. Bare disrupted gravel mining areas and murky lagoons, some in rigid geometrical forms, constitute the eyesores.

ZONE SIX: MAPLE RIDGE/BARLOW SECTOR TO FISH CREEK:

In this last zone, the natural/pastoral image is uninterrupted. The escarpment comes to the edge of river on the north. Wildlife, including white-tailed deer and herons, provide interest on a large island formed by a secondary channel.

D. CRITERIA FOR EVALUATING IMPACT OF MONTREAL ENGINEERING STUDY ON THE VISUAL CHARACTER OF THE BOW RIVER

1. It is essential that the riverbanks be maintained as an attractive, green open space system within the city, because of the importance of this corridor for visual imagability and recreational use.

2. There is a need to improve the appearance of the riverbanks in some areas by the removal of uses inappropriate to the desired green space character of the riverbanks.

3. There is a need for the preservation of a variety of landscape types and environmental experiences which maintain a richness in the urban environment for the pedestrian, bicyclist, motorist, equestrian, or canoeist travelling along the river.

4. Development along the river, especially in public areas such as parks and along scenic highways such as Memorial Drive, should take greater advantage of its location by orienting to the river.

E. THE IMPACT OF THE FLOOD PROGRAMME RECOMMENDATIONS ON VISUAL RESOURCES

The two major types of recommendations which will affect the visual resources of the river, are:

1. The proposed Engineering Works; floodway channel improvements.

2. The Flood Plain Management Programme.

1. THE IMPACT OF FLOODWAY CHANNEL IMPROVEMENTS

The impact of the specific limited engineering works proposed would not be as great as that of a more extensive programme of dyking or channel-widening, and little detrimental impact is envisioned from certain of these works. In some cases, the impact may even be positive, if properly implemented. In other cases, however, the impact of the works could be devasting in the immediate area of the projects.

(a) CREMATORIUM HILL:

This has already been implemented. It consists of a formerly active slide area which was stabalized by converting the natural scarp to a monotonous, gravel-armoured, terraced slope. The visual consequences of this are appalling and will continue to be so until major landscaping is undertaken.

However, the City engineers feel that landscaping of this project should be minimal because the irrigation required to maintain the slope in grass would probably cause further slippage. Parks and Recreation is currently experimenting with possible revegetation techniques in another area.

(b) ST. GEORGE'S ISLAND:

Much of the heaviest impact has already occurred here with the removal of between 120 and 150 mature trees (reports vary). Another 100 to 200 would be removed, with channel-widening and and rip rapping to follow. The final impact of this project would depend upon the implementation of the tree planting and other landscaping which has subsequently been recommended for the area. There could be a positive impact, especially with the removal of the unsightly parking lots south of the island.

(c) LANGEVIN BRIDGE:

In this area, the proposed channel widening would involve the removal of many mature poplar, spruce, and willow trees. In fact, it would remove the entire greenbelt along the north bank in this area, with no opportunity for replacement since the channel widening would bring the rip rapped bank up to the edge of Memorial Drive.

The channel widening on the south bank would not result in the removal of as many trees. However, it would leave little space available in the area for the establishment of a greenway in the future. Furthermore, the trees that do exist here are the only ones in the area on this bank. They perform an important service, screening the river and the north bank from unsightly urban development (parking lots, warehouses, material storage, etc.) in the Downtown area.

(d) CROWCHILD BRIDGE:

The removal of a fine stand of mature poplars and brush (required for the proposed channel widening and rip rapping) will remove the last vestige of natural amenity from this area. It also will expose the full panorama of automobile sales lots and the adjacent unsightly land fill area to the river and the opposite bank. These trees are the only significant trees along this entire stretch of the river from the Crowchild Bridge to the 14th Street Bridge.

However, there are also some unsightly concrete structures and rubble fill in the area, the removal of which could be a positive impact if it were followed by proper landscaping. That some of this would have to be done on private land could present some difficulties.

If this landscaping were not done, the results would resemble the desolate area adjacent to the Bow Trail and Hudson Bay Company warehouse.

(e) CUSHING BRIDGE:

Here the channel widening would result in the removal of a large number of mature poplar and spruce trees from the south bank, and a smaller number from the north bank. These trees are significant in maintaining a natural image for the river corridor in this area. However, they are perhaps not essential since there is generally room for their replacement, except for the area where the railroad tracks would come to the edge of the embankment. Some new planting is required in this area in any case, especially in the unsightly car lot and material storage area on the east bank downstream from the bridge.

(f) PRINCE'S ISLAND:

The channel widening at Prince's Island would not require the removal of any significant trees from the island, nor would it be likely to be of great impact otherwise if the landscaping of the work is carefully managed. Small trees and brush would be removed with the removal of the gravel bars to the northwest of the island, but these are backed up by more substantial trees on the north bank.

Some bank stabalization is already required on the northwest corner of the island to deal with erosion, and this could be combined with the proposed works.

2. THE IMPACT OF THE FLOOD PLAIN MANAGEMENT PROGRAMME

Generally, the proposed combination of flood plain management with limited engineering works would be much less detrimental to the visual and recreational resources of the Bow River corridor than more extensive engineering works would be. However, there are some aspects of these recommendations that will have a negative impact which will have to be closely examined. This impact could be increased or reduced by the manner in which the City and the Province choose to implement these recommendations, if they are accepted.

(a) VEGETATION REMOVAL:

According to Montreal Engineering in the City of Calgary Flood Study, Volume One, Bow River Report,

> "Under the flood plain management approach, a greenbelt would be maintained along the river banks. This would not be the case with engineering measures, such as dyking and channel

widening, which would require the removal of many stands of trees. These trees contribute, in a large way, to aesthetic and environmental values of the Bow River through Calgary. At the same time, it should, however, be noted that there is much volunteer growth on the river banks and gravel bars. This growth should be removed to improve the hydraulic efficiency of the river without a significant detrimental effect on aesthetic and environmental values".

The vegetation recommended for removal is perhaps less significant visually, and more easily replaced, than the larger trees, but it is still of value in maintaining the "natural" image of the riverbanks, and often also in screening the river from unsightly development adjacent to it. In fact, dense brush is far more effective as screening than are the larger trees.

It is difficult to evaluate the impact of this vegetation removal because of the vagueness of the recommendation and the confusion caused by the widely varying versions of it, which appear in previous Calgary flood studies and in the verbal statements which have been made subsequently by the Province, the City, and Montreal Engineering. The impact would depend upon how the City and the Province choose to implement this if the programme is accepted. It could vary from insignificant to catastrophic.

(b) CONTROL OF DUMPING AND STORAGE:

This aspect of the flood plain management programme should certainly have a positive impact on the visual character and recreational potential of the river's edge. Trash, land fill, snow dumping, and unsightly materials storage are now significant as eyesores along the river banks.

(c) BUILDING STANDARDS:

The aesthetic impact of the proposed building standards could be very great in some areas where new houses will have to be built with the first floor level as much as eight feet above grade. It would be very difficult to avoid clashing with the aesthetic consistency of the neighbourhood in such cases. This problem would exist primarily in Bowness and Inglewood. In most other areas, the elevation required would be only a foot or two above grade.

3. THE IMPACT OF OTHER MEASURES

(a) FLOOD FORECASTING AND PUBLIC INFORMATION PROGRAMME:

These measures would have no appreciable impact on the visual corridor or recreational uses of the river corridor, except as they might be useful in increasing public awareness of the river.

(b) BOW BEND TRAILER COURT:

The removal and relocation of the trailer court as recommended would not appreciably enhance the visual character of this portion of the river, since it is at present fairly well screened by trees and brush. It would, however, provide land for possible long term expansion of Shouldice Park, and a consequent potential enhancement of the visual character of the site.

(c) BOW VIEW NURSING HOME:

Changing the use of this structure should have no impact.

(d) FIVE BOWNESS CRESCENT PROPERTIES:

The removal or relocation of these properties would not have a great impact, although if these properties were developed as parkland, it would permit greater public use and appreciation of this attractive reach of the river.

F. RECOMMENDATIONS AND CONCLUSIONS

1. PRESERVATION AND ENHANCEMENT OF VISUAL ZONES

The character and clarity of the visual zones of the Bow River through Calgary as outlined in the beginning of this section should be preserved and enhanced. This should be accomplished through the maintenance of the positive elements such as vegetation, natural escarpments, and development reflecting appropriate relationships to the river, and through the rehabilitation of unsightly areas and eyesores. The recommended programme of limited engineering works and flood plain management should be used as the framework for the overall management of the visual resources of the Bow River.

Development guidelines should be effected requiring the establishment, or preservation, and the maintenance of vegetated areas with screening of unsightly private development from the river in all areas. In the natural image areas, upstream from the Crowchild Bridge and downstream from the C.N.R. Bridge, all development should be screened from the river except for isolated farm structures which would be appropriate to a pastoral character.

2. VEGETATION REMOVAL

In general, the greatest impact on the visual and recreational resources would be in the area of vegetation removal, both that necessitated by the specific engineering works and that practiced as a part of the flood plain management programme - the "selective removal of vegetation" from the floodway.

No vegetation which is vital to the visual character of the river should be removed unless specific plans are presented for its removal and replacement. Such vegetation becomes critical in areas in which it is the only green relief to an otherwise artificial scene (such as at the Crowchild Bridge) and also in most park areas, where a natural image is desired (such as the Pearce Estate and Montgomery Flats areas).

Also, vegetation in some areas has an important role in screening unsightly elements from the river, or from the opposite bank. Clarification should be obtained as to the policy on the replacement of vegetation, or the addition to it, in the floodway in areas where the existing vegetation is insufficient or where its useful life is near an end.

Site plans establishing planting and other landscaping must be established concurrently with the detailed design of the engineering works. Furthermore, the specifications for the landscaping and, equally important, the continued maintenance of the lanscaping should be written into the original contract for the proposed engineering works. Otherwise, such work is too easily put off, as is evidenced by the Crematorium Hill project. Furthermore, without continued maintenance, the landscaping might not establish itself sufficiently well on the banks and would likely be washed away with each high water, with little likelihood of being replaced.

Where exposed rip rap cannot be avoided, it should be of good visual quality subject to the approval of a landscape architect.

For such visually dominant features as escarpments, natural, rather than exotic, vegetation should be retained or re-established - not only to pressure a natural image for these features and thus providing a contrast to the urban image of the City, but also for reasons of economy and safety. It would be difficult, often impossible, to establish or maintain manicured lawns on the escarpments, and the irrigation required would cause slipage. Natural prairie grasses should not present such a problem.

3. PUBLIC LAND USE IN THE FLOOD PLAIN

The City and the Province should dedicate all undeveloped public land in the flood plain, especially in the floodway, as parkland and establish specific plans for its recreational development, or for its preservation as natural area.

It is declared objective of the City in the 1973 Calgary Plan to: "develop the river valleys as an open space system which includes:

(a) Continuous public access to all river banks at all times and public footpaths throughout the City.

(b) Good recreational facilities in appropriate locations.

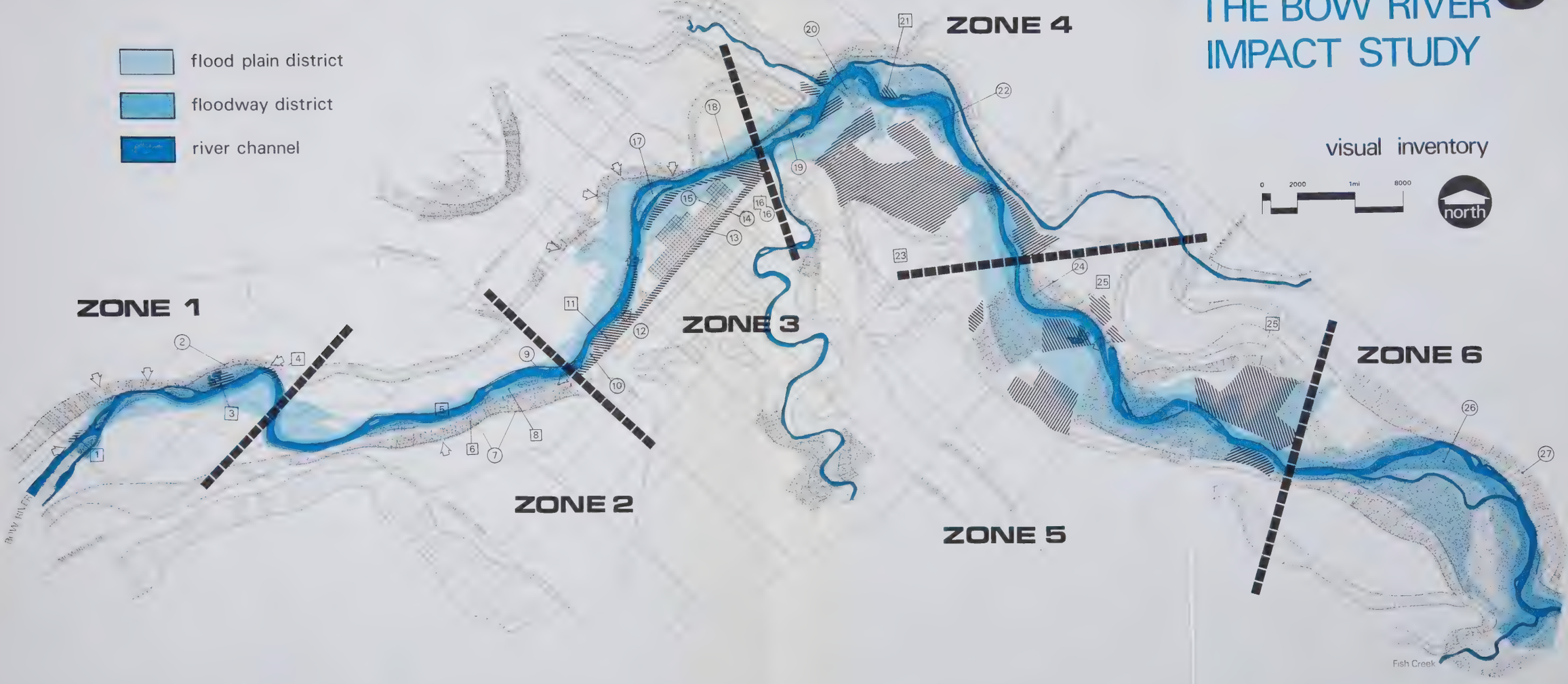
(c) Protection from air, water, and visual pollution".

However, the allegations of some groups that the City intends to use riverbank lands for such inappropriate uses as structures and roadways have some credance, as in the case of the electrical substation recently constructed in the Crowchild Bridge area. Much of the public land is, at present, amongst the most unattractive and poorly maintained on the river.

4. PRIVATE LAND USE IN THE FLOOD PLAIN

In keeping with the above stated City objective to "develop the river valleys as an open space system . . .", such visually-disruptive uses as gravel mining should be discontinued in the flood plain as well as in the floodway (the latter having been recommended by Montreal Engineering). Furthermore, areas already disturbed should be rehabilitated through a restoration of natural appearing contours and a programme of replanting.

THE BOW RIVER IMPACT STUDY 3



Legend

- major green areas
- major cityscape areas
- major unsightly areas
- major views
- (3) visual features, landmarks
- [3] eyesores

eyesores

- [1] junk yard
- [3] gravel mine
- [4] Crematorium Hill
- [5] drive-in
- [6] slide
- [8] land fill
- [11] warehouses, car lots
- [17] junk yard
- [21] junk, storage
- [23] RR yards, industry
- [25] gravel mine

features

- (2) escarpment (grass)
- (7) escarpment (forest)
- (9) gull island
- (10) isolated trees
- (12) Mewata Park
- (13) downtown skyline
- (14) Calgary Tower
- (15) China Town
- (16) Ft. Calgary
- (17) Prince's Island
- (18) Memorial Dr. Prkwy.
- (19) St. George's Island
- (20) Pearce Estate
- (22) Bird Sanctuary
- (24) Millican Estates
- (26) natural area
- (27)

SECTION 4. A RECREATION ANALYSIS AND IMPACT ASSESSMENT

A. PURPOSE

B. THE NATURE OF THE RECREATION ANALYSIS UNDERTAKEN

C. ANALYSIS

ZONES ONE AND TWO: 85th Street Bridge to Crowchild Bridge

ZONE THREE: Crowchild Bridge to the Elbow River

ZONE FOUR: The Elbow River to the C.N.R. Bridge

ZONE FIVE: The C.N.R. Bridge to Maple Ridge

ZONE SIX: Maple Ridge to Fish Creek

D. CRITERIA FOR EVALUATING THE IMPACT OF THE BOW RIVER FLOOD STUDY ON THE RECREATIONAL RESOURCES OF THE BOW RIVER

E. IMPACT ASSESSMENT

1. Engineering Works
2. Flood Plain Management
3. Other Measures

F. RECOMMENDATIONS AND CONCLUSIONS

A RECREATIONAL ANALYSIS AND IMPACT ASSESSMENT

SECTION 4

PART FOUR: A RECREATION ANALYSIS AND IMPACT ASSESSMENT

A. PURPOSE

Water is universally recognized as a desirable feature for outdoor recreation areas, even if the activities in these areas do not involve it as directly, as do canoeing, fishing, and so on. A river valley such as that of the Bow, may be utilized not only in a localized manner, but as the basis for a comprehensive urban or regional system, as is outlined in the most recent Calgary Plan. This system could be utilized to establish linkages between currently isolated riverbank parks and to fill out the developing pedestrian, equestrian, and bicyclist systems in the City. Essential to all of the above, however, is the need to provide "continuous public access to all riverbanks at all times and public footpaths throughout the City". (Also from The Calgary Plan).

B. THE NATURE OF THE RECREATION ANALYSIS UNDERTAKEN

The primary focus of this section is upon the broader scale of recreation within the Bow River Valley in Calgary, the recreation systems, facilities, and areas with city-wide, rather than just local, appeal. The river is also a vital element in community-oriented recreation, but this has been covered in the section on communities.

First of all, an inventory is made identifying existing, and planned park areas, and other open space, as well as significant informal uses. Then the existing planned, and proposed linkage systems are examined. Criteria are then established, reflecting management objectives with respect to existing and projected need within Calgary. Finally, the recommended measures are evaluated to determine their potential impact, whether positive or negative.

C. ANALYSIS

Although there are some extremely attractive areas along the river, much of the river valley still represents recreational potential rather than fact. For convenience, the visual zones from the previous section can be utilized in the inventory of the recreational resources of the Bow River.

ZONES ONE AND TWO: 85th STREET BRIDGE TO CROWCHILD BRIDGE:

RECREATIONAL USES

This uppermost portion of the river contains a relative abundance of existing and proposed parks. Included are the following existing park areas:

1. The eastern end of Bowness Park: A fairly informal wooded picnic area.

2. Shouldice Park: A highly developed park with picnicing, baseball, a swimming pool, and other uses and facilities. This park is slated for expansion.

3. Edworthy Park: A day camp /group picnic area in a meadow with a fringe of spruce trees along the river. This park is also planned for expansion.

4. The Wildwood escarpment: An extremely natural-appearing area with a hiking trail and viewpoints.

PLANNED FOR FUTURE DEVELOPMENT ARE:

1. Lowery Gardens: A wooded area with a land fill site near the river.

2. Montgomery Flats: A gravel mining area on the north bank below the escarpment. It is wooded for much of its area, and contains two lagoons which are to be incorporated into the recreational development.

INFORMAL USE AREAS INCLUDE:

1. Islands leased by C.P.R. from the province just below the 85th Street Bridge. These are much used by children, though the only access is by a hazardous railroad bridge where a child has already been killed.

2. An underdeveloped area on the south bank, near the islands, is heavily used by Bowness residents, both families and teenagers.

3. The escarpment on the northern edge of the river valley, which is utilized by motor cyclists for scrambling.

4. Gravel shoals along the north bank across from Wildwood where strolling and sunning occur.

ACCESS AND LINKAGES

On the south bank, access is good in the park areas, except for the barrier of the railroad tracks, but there is little chance of connecting the Edworthy Park/Lowery Gardens area with Bowness Park because of the extensive private holdings. The hiking trail

along the Spruce Cliff escarpment, however, provides a marvelous, near-"wilderness" experience unique for Calgary. On the north bank, the Chinook Trail pedestrian pathway currently runs, somewhat informally, from Shouldice Park down to Memorial Drive Park, east of the Crowchild Bridge. Expansion of the trail is planned from Shouldice Park north to Montgomery Flats and then, via a pedestrian bridge constructed in association with the planned Sarcee Trail Bridge, through Bowness to Bowness Park.

ZONE THREE: CROWCHILD BRIDGE TO THE ELBOW RIVER CONFLUENCE.

RECREATIONAL USES

This is a mixed area subjected to significant pressures for development and scheduled for major transformations in the near future. It includes the most attractive urban park area on the river, Prince's Island, as well as the most highly-developed segment of the city-wide pedestrian pathway system - the one along the dyke next to Memorial Drive. The island is very heavily used by people for informal activities such as sunning, strolling, bicycling, picnicing, frisbee throwing, dog running, paddle boating (in the lagoon), and the like. It is also the site of outdoor concerts and miscellaneous pagentry. Memorial Drive Park is less intensively used, but is poplar with joggers, walkers and cyclists because it offers a fairly long pathway.

ACCESS AND LINKAGES

The excellent access on the north bank, and on Prince's Island, is contrasted by the dismal situation of the south bank, which is currently unkempt, ill-maintained (except for the stretch adjacent to Prince's Island) and difficult to reach. Consequently it is little used.

A long, bleak stretch of ugly rubble concrete rip rapping accurs along the riverbank, which is separated from the downtown by the Bow Trail expressway. Snow dumping also occurs in this area, creating a further barrier to the river as well as adding pollution. The only amenity in this stretch of the south bank is a fine riverbank stand of mature poplar (which is recommended for removal with channel widening).

Furthermore, most holdings of City land in this area have been sold to commercial interest over the past few years. Although the area was well suited for park development, it was argued that the price established by the Calgary City Land Department was beyond the power of the Calgary City Parks Department to purchase. Although this area was initially planned for a high rise complex, what has developed instead are: two warehouses, a City electrical substation, and two automobile dealership facilities. The latter of these has failed to fulful an obligation to the City for landscaping of the riverbanks.

The Downtown Open Space Plan of the City will affect the area from the Metawata Stadium to the Fort Calgary site, with the implementation of a pedestrian pathway and open space system along with an extensive tree-planting programme.

The City Parks Department is currently preparing a plan to extend a pedestrian pathway from this stretch westward along the Bow Trail to the Crowchild Bridge. It would be difficult, though not impossible, to landscape in this area, due to the restricted width of the land and the presence of the rip rap, noise, and pollution.

ZONE FOUR: THE CONFLUENCE WITH THE ELBOW RIVER TO THE C.N.R. BRIDGE:

RECREATIONAL USES

The Memorial Drive Park terminates here. Other park areas are numerous and include such intensively-utilized sites as the Calgary Zoo on St. George's Island, a camping/picnicing area on the adjacent St. Patrick's Island (to be occupied by Zoo expansion) and the Inglewood Golf Course (private).

Natural areas such as the Pearce Estate and the Inglewood Bird Sanctuary are potential attractions, but are under-utilized, largely because of vague access and lack of public knowledge.

ACCESS AND LINKAGE

Access to the river in this zone is available in somewhat discontinuous segments, separated by fenced industrial sites and residential lots.

The Inglewood Designs Brief recommends that "pedestrian systems must be developed or reinforced to tie the major public amenities together and to make them more accessible". Even in the park areas, river access is generally not featured. The Zoo does not orient to the banks at all and only vague trails lead down to the river. An informal path runs along dykes on the west bank in the area downstream from the Pearce Estate. This system could be upgraded fairly easily.

ZONE FIVE: C.N.R. BRIDGE TO MAPLE RIDGE:

RECREATIONAL USES

The principal recreation area is the low-lying flood plain site below the escarpment at the Millican Estate, just south of the C.N.R. Bridge. The area currently has heavy informal recreational use by picnicers and motorcyclists and has been dedicated as a City park. The City plans to develop it as a family picnic area.

Just below the Graves Bridge there is a large lagoon which has tentatively been planned for recreational development. Another area south of this, a low-lying, largely wooded area in the Barlow Sector, could easily be developed for recreation, but is currently under study for use as a gravel mining area.

ACCESS AND LINKAGE

Public access, either for pedestrian or motorists, is generally very poor due to the presence of the gravel mining operations. Access to the dedicated park area is currently via an obscure, rough, single-lane dirt road.

ZONE SIX: MAPLE RIDGE TO FISH CREEK:

RECREATIONAL USES

Although this is the most attractive portion of the river, only limited recreation occurs here in the form of people passing through in canoes and rafts. The major exception is at the very end of the zone, in the Fish Creek area, where fishing is extremely popular. There will be a major park in this latter area with the development of Fish Creek Provincial Park.

ACCESS AND LINKAGE

Except for a few trails in the vicinity of Fish Creek, access to the river for motorists, pedestrians, or bicyclists is not developed.

D. CRITERIA FOR EVALUATING THE MONTREAL ENGINEERING STUDY ON THE RECREATIONAL RESOURCES OF THE BOW RIVER

1. Foremost is the need to preserve and enhance the existing parklands. Calgary can ill-afford to lose these valuable resources, as its population increases, open space becomes scarcer, and recreational activities become more poplar.

2. It is also essential that greater opportunities for access to the river and to the river-related park areas be developed. The Bow River should be treated as more of an asset than it has been in many areas to date. Any actions to reduce this access should be avoided.

3. There is a need for further linkages to create a comprehensive recreational system of the city's scattered park areas and special features to accommodate such linear forms of recreation as bicycling, walking, and horseback riding. Canoeing and rafting, should also be provided for by the development of a system of lagoons and other sheltered waters for rest areas and safe launching. Such systems could also serve to link the major recreational areas and features, increasing the variety and flexibility of these resources while providing destinations for people utilizing the pathways.

4. The diversity of recreational experiences capitalizing upon the rich natural areas and features of Calgary, should be increased. The "wilderness" type hiking trail on the Spruce Cliff escarpment is an example of a variation from the standard urban pedestrian pathway. Opportunities for bicycling and horseback riding trails should also be developed, and a variety of park areas, from the "wild" natural area to the highly urban, should be created and maintained to strengthen the identity of the different zones the river passes through.

5. There is a need to preserve existing underdeveloped areas of river valley land for future recreational needs of the city.

6. Existing riverbank vegetation provides an excellent opportunity, if retained, for the ready-made landscaping of park areas. This would save much of the Parks and Recreation budget, while also providing mature trees immediately rather than within a decade or so.

E. IMPACT ASSESSMENT

1. LIMITED ENGINEERING WORKS

The impact of the proposed limited engineering works would not be as great as that of a more extensive programme of dyking or channel-widening, and little detrimental impact is envisioned from some of the works. Others, however, would have a great negative impact because of the relative significance of the resources to be affected within their immediate areas.

(a) CREMATORIUM HILL

The engineering work has been completed in this area. The site in its present form with its harsh, monotonous, rip rap-armoured slopes is very unattractive for any type of recreation and will continue to be so until landscaping is implemented. The area is consequently not an attractive one for the development of the proposed extension of the Chinook pedestrian trail to link Shouldice Park to Montgomery Flats.

(b) ST. GEORGE'S ISLAND CHANNEL-WIDENING

The proposed channel-widening in this area will remove most of the Zoo parking from the south bank. The functional inconvenience caused could be out-weighed by the benefits of the partial flood protection, as well as the landscaping that is planned for the area, since most of the serious impact has already been sustained in the form of tree removal (see Visual Resource section).

(c) LANGEVIN BRIDGE CHANNEL-WIDENING

Besides the large number of mature trees to be removed in this area, the recommended measures would also require the removal of the existing well-developed pedestrian path from the north bank, some of which was constructed as recently as the summer of 1973. On the narrow strip of land to remain, there would be little possibility to develop anything more than a naked sidewalk along Memorial Drive.

The impact would be of a similar nature on the south bank, but not as severe because of the availability of more land for replanting.

(d) CROWCHILD BRIDGE CHANNEL-WIDENING

The proposed channel-widening would greatly reduce the recreational potential of this reach of the riverbank. The removal of the trees here, the only ones in the area, would result in a monotonous area with the last of the screening against the car lots removed. The salvaging of a linkage in this area between the Lowery Gardens and the Prince's Island/Downtown area will be difficult, but it is currently under study by Parks and Recreation. Without landscaping, this area could be expected to become an extension of the harsh, bleak rip rap-armoured bank found along the Bow Trail expressway.

(e) CUSHING BRIDGE CHANNEL-WIDENING

The impacts of tree removal and bank-widening in this area would not be as great as in other areas - if adequate landscaping is subsequently implemented - since there is sufficient area for rehabilitation along most of this reach.

An informal pathway would be removed on the south bank, but could be relocated.

A positive impact would involve the removal of the piers of the former Cushing Bridge which are hazards to canoeists and rafters.

(f) PRINCE'S ISLAND CHANNEL-WIDENING

The channel-widening here would slightly reduce the area of Prince's Island, but most of the reduction would be in an unused strip along the north side which is frequently inundated by normal high water. Erosion protection fro the banks could also be incorporated in the works.

2. FLOOD PLAIN MANAGEMENT

(a) AVAILABILITY OF LAND FOR RECREATIONAL USES

The restrictions contained in the proposed flood plain management programme would prohibit development in the floodway zone and generally tend to discourage it in the flood plain zone. This would be compatible with the city's objectives to expand some existing park areas along the river, establish others, and continue to fill out the pedestrian, bicycle, and equestrian pathway systems on the river banks.

However, conflicts could occur in areas coveted by the city engineers for highway locations. Several existing and planned park areas are already disrupted or threatened by a number of expressways: Montgomery Flats by the Sarcee Trail, Edworthy Gardens by the Shaganappi Trail, the Inglewood Golf

Course by the Blackfoot Trail, and the Downtown riverbanks by the Bow Trail. It is common practice for highway engineers to seek out public land, including parkland, for right-of-way locations.

(b) LOCATION OF PARK STRUCTURES

One consideration that will have to be taken into account regarding the floodway zone is the fact that the prohibition of structures in the floodway will also extend to parks' structures such as restrooms, refreshment stands, and the like in Lowery Gardens, the Pearce Estate, and the area below the Millican Estates, the majority of the park would be in the floodway. The facilities would have to be located at a great distance from the river, (generally 700 to 950 feet in the case of Pearce Estate) making an orientation to the river difficult. This would be most critical for the Zoo, which has planned expansion onto St. Patrick's Island, all of which is in the floodway zone.

(c) REMOVAL OF GRAVEL MINING FROM FLOODWAY

All gravel mining will cease in the area as part of the condition of establishing the land use districts. Abandoned pits have a fortuitous potential use as sites which could include water orientated recreation, canoeing and fishing.

(d) VEGETATION REMOVAL IN THE FLOODWAY

This recommendation could have profound implications for existing and planned parks and pathway systems along the riverbanks if too zealously implemented. The vegetation along the banks is one of the prime elements making the area attractive for recreation. It often, in fact, occurs only along the banks.

(The "selective removal" of vegetation in the floodway is discussed at greater length in the Biological and Visual sections.)

(e) PROHIBITION OF THE OPEN STORAGE OF EQUIPMENT, MATERIAL, OR GOODS FROM THE FLOOD PLAIN

This would have a positive impact. Many areas are currently blighted by such unsightly storage, and its removal could also free up undeveloped land for recreation, in some cases.

3. OTHER MEASURES

The other recommendations of the City of Calgary Flood Study Bow River Report would generally have little or no impact. These recommendations are as follows:

(a) FLOOD FORECASTING SYSTEM

No impact.

(b) PUBLIC INFORMATION PROGRAMME

This would have no appreciable impact on the recreational uses of the river corridor, except as it might be useful in increasing public awareness of the river from a positive standpoint, as well as the negative aspect of flooding.

(c) MISCELLANEOUS SPECIFIC MEASURES

BOW BEND TRAILER COURT

The removal and relocation of the trailer court as recommended would provide land for possible expansion of Shouldice Park and a consequent strengthening of the linkages of riverbank recreation systems.

BOW VIEW NURSING HOME

Changing the use of this structure should have no impact.

FIVE BOWNESS CRESCENT PROPERTIES

The removal or relocation of these properties would provide opportunity for public access in this area where none presently exists, as well as an opportunity for linkage of Bowness Park with the rest of the recreation systems.

F. RECOMMENDATIONS AND CONCLUSIONS

1. An overriding policy is required that gives priority position to the recreational resources of the Bow River Valley in Calgary. This measure could still permit application of the flood management land use districts and could be implemented as follows:

   (a) The city and the province should dedicate all undeveloped public land in the flood plain, especially in the floodway, as parkland (as mentioned in the Visual Resource section). This would eliminate the current system whereby the City Parks and Recreation Department must attempt to out-bid private developers to obtain public river valley land from the City Land Department.

   (b) The City should place a high priority on implementing its proposal for developing "the river valleys as an open space system".

   (c) Parks with a substantial portion of their areas in the floodway zone should be managed as natural areas because of the prohibition against the construction of structures in this zone.

   (d) Wholesale vegetation removal in the floodway should not become a component of the programme. Any limited removal which is imperative for the maintenance of the public safety should be shown clearly in a plan and then be subject to the review and approval of the City Department of Parks and Recreation (see Visual Resources section for related further recommendations).

(e) A variety of park types, from natural areas to manicured urban parks, should be created and maintained by the preservation of existing natural areas and the rehabilitation of presently disturbed areas within the flood plain, such as the gravel mining areas in the southeast. This policy could be utilized to strengthen the identity of the different zones along the river. The preservation of existing vegetation will be essential to the former, as the possibility of the addition of new vegetation will be essential to the ladder.

(f) Detailed plans for all engineering works on the river, including bridges, should incorporate non-vehicular pathways as well as landscaping (see also Visual Resources Section). These projects, if they must be implemented, should increase rather than reduce public access to the river and the linkage of existing parks.

THE BOW RIVER IMPACT STUDY 4

Legend

- developed parks
- planned parks
- public open space
- private open space
- private recreation

access ★ excellent ■ poor ▲ good □ none

recreational resources

1. Bowness Park
2. Shouldice Park
3. Edworthy Park
4. Lowery Gardens
5. Shaganappi Golf Course
6. Reily Park
7. Jubilee Auditorium
8. Confederation Golf Course
9. Confederation Park
10. Prince's Island
11. Downtown Riverbank
12. Memorial Drive Park
13. Fort Calgary
14. St. Patrick's Island
15. St. George's Island
16. Fish Hatchery
17. Pearce Estate
18. Inglewood Golf Course
19. Bird Sanctuary
20. Stampede Grounds
21. Millican Estates Park
22. Stanley Park
23. Harvey Park
24. Glenmore Park
25. Fish Creek Park

SECTION 5. A BIOLOGICAL ANALYSIS AND IMPACT ASSESSMENT

A. THE BIOLOGICAL RESOURCES OF THE BOW RIVER AND ITS FLOOD PLAIN

1. The General Ecology
2. The Terrestrial Biological System
3. The Bow River Biology

B. THE IMPACT ASSESSMENT OF THE FLOOD MANAGEMENT PLAN

1. General
2. The Floodway District
3. The Flood Plain District
4. The Engineering Works

C. DISCUSSION AND RECOMMENDATIONS

A BIOLOGICAL ANALYSIS AND IMPACT ASSESSMENT

SECTION 5

PART FIVE: A BIOLOGICAL ANALYSIS AND IMPACT ASSESSMENT

A. THE BIOLOGICAL RESOURCES OF THE BOW RIVER AND ITS FLOOD PLAIN

1. THE GENERAL ECOLOGY

The study area comprises a small part of the Bow River watershed, namely the river itself and its flood plain, within the City of Calgary. In this area, the river flows through a relatively narrow flat valley in a well defined stream channel with a moderate gradient. The river course is relatively straight; meandering is only casual. Although the river is young, its normal activity, cutting new courses and redistributing materials, is curtailed by control programs, such as bank stabilization and channel clearing. A few extensive steep banks occur but most of the river land is flat and constitutes a flood plain which is subject to periodic inundation. As a result of the linear discreteness of the river and the valley character no significant natural wetlands or water bodies (apart from the river itself) occur. The whole makes up the habitat base for a riverine ecosystem containing a complement of diverse vegetation and wildlife.

Two principal biological systems function within the riverine ecosystem. One is aquatic. It is made up of fish, invertebrates and other organisms within the Bow River. The other is terrestrial; it comprises a variety of life forms including animal and vegetational complexes. A distinctive aspect of the ecosystem is manifested in the physical association of the two biological systems. The terrestrial components for example are rich and varied because of the nearness of the river. Some vegetational types exist in the river flats only because of the water influence which is expressed through a high groundwater table or seasonal flooding of the land surface. Some of the animals which occur in the area depend upon nearby water for certain life requirements such as a place to deposit eggs and rear young (e.g., amphibians) or as a place to find specific food (e.g., some birds). Water alone, however, does not provide the total support for these animals. They still rely on certain conditions in the terrestrial environment for nesting, food and cover. The biological character of the riverine ecosystem is a function of the quality of the terrestrial and aquatic environments and it is particularly enhanced in the area because of the interface circumstances of the two systems.

Parts of the study area have been considerably altered by man-induced land uses and can no longer be considered "natural". However, parts have survived in a relatively pure state and constitute the basis for the wild aspects of the area. The local riverine environment thus contains a high diversity of native flora and fauna which is a valuable recreational, educational and scientific resource within an urban setting. Surrounding areas have been subject to extensive land uses (urban, industrial or agricultural), and no longer have a quality base for wild vegetation and animals that compares with the study area.

2. THE TERRESTRIAL BIOLOGICAL SYSTEM

This aspect of the overall study deals only with those land areas that are covered with sufficient pristine vegetation to be considered "natural" albeit some components could be the result of man's activities. The remaining areas are either void of vegetation or the land cover on them is totally man-managed. These disturbed areas can and do support some wildlife (gophers, mice, robins, sparrows, pigeons, etc.), but for the purposes of this study this fact was not accounted in ecological discussion; they are inventoried and delineated in the sections of this report dealing with aesthetic and recreational or community considerations.

Thirty-one discrete natural areas have been identified within the study area. They are portrayed in Map 5 and described in Appendix A. The information base was derived from air photo interpretation, field observations and from various reports including the records and documents of the Calgary Field Naturalists Society.

The various natural areas of the Bow River flood plain have certain features in common. Generally, the dominant tree species is balsam poplar. Aspen poplar is found only in a few drier sites. Two of the more common tall shrubs are tall willow and black birch; the former being found typically in wetter areas at the river's edge. Numerous small shrubs are also found; these include a variety of willows, swamp birch, alder, and red osier dogwood.

The cover conditions and the variety of food alternatives provided by these vegetation types allows for the existence of a variety of wildlife. Beaver, porcupine, and mule deer are frequently observed mammals. Among the birds found in the Bow River flood plain are: Canada goose, mallard, common merganser, red-tailed hawk, kestrel, killdeer, spotted sandpiper, great horned owl, belted kingfisher, yellow-shafted flicker, Eastern kingbird, black-capped chickadee, brown creeper, American robin, red-winged blackbird, Baltimore oriole, and rufous-sided towhee. Numerous species of reptiles, amphibians and invertebrates also occur in the area.

The species of flora and fauna which occur in the riverine environment are presented in the report prepared by the Calgary Field Naturalists Society, entitled, "Five Natural Areas' in the City of Calgary". The scientific names of the plants and animals cited in this text are listed in Appendix B.

The character of each natural area was interpreted in terms of quality conditions that would allow a rating of its relative importance in the overall ecosystem. A summary description of each area is presented in Appendix A on the basis of three features:

(a) Cover Vegetation

The nature of the vegetation in a natural area interpreted in terms of the predominant type, diversity and interspersion. Apart from providing a description of the vegetation features of the area this information was used to determine wildlife capability on the basis of two assumptions:

(i) the more diverse the vegetation cover, the higher the diversity of wildlife;

(ii) the greater the degree of interspersion of cover types, the greater the area of "edge" hence the greater the capability for wildlife abundance.

(b) Disturbance

A measure of artificial land uses within a natural area due to activities such as roads, gravel mines, trails, the introduction of exotic vegetation, etc.

(c) Key Wildlife

The occurrence of wildlife species in a natural area which indicate the completeness or "health" of the system. The index species were those on top of the food chain such as birds of prey which were readily detectable.

Comparative evaluations were made for each natural area on the basis of the above characteristics. A scale ranging from "one" to "five" was employed with "one" being the best and "five" the poorest. The areas delineated in Map 5 have been rated accordingly.

An area which had a high degree of interspersion and diversity of cover vegetation types, was relatively undisturbed and had key wildlife species present was considered the best, or a class "one" natural area. A class "five" area had characters at the opposite end of the scale to those qualifying a class "one" area. Class "two", "three" and "four" areas invariably contained a combination of good and poor rated characters and subjective judgement was employed to determine these class assignments.

3. THE BOW RIVER BIOLOGY

The Bow River itself is the only water feature considered in this study. No other consequential aquatic resources exist, if one disregards the extreme lower portions of tributary streams such as Nose Creek and the Elbow River. Some water-filled gravel pits occur but no proposed courses of action have been identified which will affect them. At the moment they play an insignificant role in support of the riverine ecosystem. Therefore, their loss, if so dictated, would be inconsequential. On the other hand, the gravel pit ponds have a potential for use primarily as part of recreational complexes including small managed fisheries. Until action is identified that will affect the ponds the potential remains unimpaired.

The Bow River has three principal ecosystem functions within the study area:

(a) It supports the character of the terrestrial vegetation through seasonal flooding and a high groundwater table;

(b) It creates "edge" thereby contributing to the carrying capacity for terrestrial wildlife;

(c) It offers specific habitat for the support of amphibious and aquatic animals some of which, in turn, constitute food sources for some unique wildlife in the area.

Apart from the ecosystem support function and the aesthetics of having a quality aquatic animal complex in the area the major use of the Bow River, in the biological sense, is as a fishery.

Although a variety of fish species occurs in the Bow and plays a role in the river's ecological system, aspects of habitat quality and impacts are considered in relation to the present game species. These species are on top of the food chain and, as such, their occurrence and welfare can be used, both now and in the future, as an index of the conditions that prevail in that system. Furthermore, general public appreciation of the Bow River as a biological system would likely be manifested in the question, "How's the fishing?".

Three species, Rainbow trout, Cutthroat trout and Mountain whitefish are the principal game fishes. The status of their populations remain unqualified, however, the general proclamations of the Alberta Department of Lands and Forests rate the fishery as "high". Support for this belief comes from the Canada Land Inventory identification of the river's capability for sport fisheries which evaluates the section of the Bow in the study as "having no significant limitations on sport fish production". In other words, the base conditions (physical and chemical environment) for a productive sport fishery occur in this part of the Bow River.

Interview information garnered from discussions with anglers who currently fish the Bow River generally indicates that these users have a high regard for the fishery. They see the river as being productive and as an important natural recreational resource readily accessible within an urban setting. The more skilfull anglers appear satisfied with catches that they are obtaining but place more emphasis on the importance of the fishery as a recreation site for children and for people in general who are less able to go elsewhere.

The quality of the fisheries habitat depends on the chemical and physical environment of the river. All the available information indicates that the chemical conditions of the water are good. There are no undue pollutants, and sediment loads are not excessive. Water quality monitoring by the Pollution Control Division of the Alberta Department of the Environment indicates a progressive improvement over recent years as to water quality conditions. If past conditions in any way impeded fisheries use, the constraint seemingly would no longer apply.

The physical aspects of the habitat are expressed in the following conditions:

(a) Relatively clear, cold, fast moving water (which is favoured by the designated game species).

(b) Favourable channel conditions which include:

(i) desirable pool-riffle complexes (riffles are areas of food production and oxygen replenishment; pools provide slack water where fish may await drift food with minimal energy expenditure while maintaining a position in the river);

(ii) areas of turbulence occurring as a result of currents moving around obstructions and of tributary inflow as in the case of the Elbow River confluence (such areas support the concentration of food by mixing and distributing drift materials);

(iii) stretches of clean gravelly river bottom required for spawning, particularly for the designated game species;

(iv) shallow, shaded backwater areas which provide refuge for young fish.

There is no site specific delineation of these features. They occur as parts of the river complex as identified through field observations and information conveyed by personal communication and from reports.

This general physical condition is partially stabilized by river control mechanisms already at play. Natural river development is curtailed by measures applied to fix the position of the existing river course. Left to its own devices the river could erode new channels resulting in more slack water areas and higher sediment loads; (These postulated conditions would otherwise favour the advent of large populations of rough fish at the expense of the existing game species.) The management practices, although interfering with natural processes, tend to hold the river at its high level of capability for the game species.

B. THE IMPACT ASSESSMENT OF THE FLOOD MANAGEMENT PLAN

1. GENERAL

The flood management plan identifies two general courses of action which are reaction points for evaluating impacts on the biological system. These actions are:

(a) The implementation of a land use zoning scheme which would control the kinds of activities within the study area. Two categories of use are proposed relative to two sub-zones, a floodway district and a flood plain district. In either case, potential impacts relate primarily to effects on the terrestrial biological systems. The measure of impact is chiefly expressed in the kind and degree of encroachment on, and disturbance of, natural areas.

There could be a very minor impact on the fisheries capability of the Bow River resulting from the removal of streamside vegetation. Without bank shade the quality of backwater areas as habitat for young fish may be reduced providing vegetational removal occured at a particular site that otherwise functioned as this kind of habitat. This fact is unknown due to lack of site specific information on where vegetation will be removed. This potential impact can only be regarded generally, but for working purposes, the effect is declared to be inconsequential to the fishery resource.

The impact discussion on the effect of the land use zoning scheme relates only to the terrestrial biological systems. No effect on the biology of the Bow River is assumed.

(b) The implementation of an engineering works plan to facilitate the freer passage of flood water through the area. This would be accomplished through clearing parts of the channel of obstructions, removing vegetation and through channel widening. The character of the river channel would be changed, hence there will be an effect on the fisheries capability of the river. Vegetation cover would be removed, hence there will be an influence on the terrestrial biological system. The action of channel clearing thus has impact on both of the principal biological systems in the area.

In some instances, the engineering works proposals are site and action specific, and impacts were evaluated accordingly. In other instances, some of the proposals are general with respect to location and to action (especially the degree of action). Some effects were therefore identified on a general basis.

A summary of impacts of the flood management plan on the biological systems is presented in Table B-1.

2. THE FLOODWAY DISTRICT

The general concept of the floodway district, as indicated in the Montreal Engineering Report, proposes a prohibition on intensive land uses within that part of the study area immediately flanking the river. In general, it may therefore be construed as having a positive impact on the biological systems relative to no plan, which could allow uncontrolled land uses.

Although the proposed zoning restrictions increase the chances of conserving natural areas, they do not guarantee that this will be the case. Extensive land uses such as playgrounds, golf courses, roads, etc., could occur. These uses could result in drastic changes to the landscape, including the decimation of natural areas where encountered. The floodway district plan thus has the potential of reducing the wilderness aspects of the study area. It may be possible, however, to plan such developments so that they can incorporate natural areas as viable units with no or minor modifications to them. This contention remains as a hypothetical recourse until such planning takes place.

The boundary lines of the floodway district have been determined on the basis of spatial needs to move water, assuming that such space was free of certain flow impediments. These lines frequently course through existing natural areas (Map 5), thereby subjecting them to dissection with different land uses allowed in each piece. Land uses beyond the jurisdiction of the floodway district are generally intense, thereby the outside pieces could be liable to decimation. There are size limitations to the viability of natural areas, especially if a criterion of their value is biological diversity. Smaller pieces remaining within the floodway district, even though they retain some of the essential components as the whole, may lose the capability to support some animals which demand size as part of their habitat requirement. This problem could be overcome by adjusting the boundary lines to conform with configuration of selected natural areas.

ACTION	PROPOSAL	IMPACT
Two District Concept in Flood Management	Floodway land use controls.	Increased possibility for the preservation of natural areas but some devastating uses could occur.
	Vegetation removal in Floodway and Flood Plain zones.	Could result in total loss of some important natural areas or loss of integrity in others with corresponding losses in aesthetics and wildlife and recreational values.
		Possible minor reduction in the fisheries capability of the Bow River resulting from loss of bank vegetation.
	Flood Plain land use controls.	No fortuitous or deliberate provisions for the protection of natural areas, hence, they are vulnerable to decimation.
	Land use zoning without acknowledgement of natural areas.	Decreases the possibility of preserving portions of some important natural areas and the integrity of remaining parts.
Engineering Works	Channeling and dyking.	Minor impact on natural areas.
		Some reduction in fisheries capability due to loss of shoal spawning areas. Bank side habitat and pool-riffle complexes.
	Removal of bars and obstructions.	Loss of habitat for some water oriented birds.
		Reduction in fisheries habitat due to loss of coarse substrate (spawning and food production), pool-riffle complexes (feed and cover) and areas of turbulence (feed and cover).
	Sedimentation.	Temporary high loads which would reduce the quality of the habitat and redistribution of sediments arising from new current patterns which could smother spawning and food producing sites.

The currently designated floodway district would contain 15 natural areas as units that exist today (Map 5 and Table B-2). Of these, nine would be class "2" or "3" areas, and six would be class "4" or "5" areas. The only class "1" area within the study block would be dissected by the floodway boundary line, as would eleven class "2" and "3" areas and four class "4" areas. These sixteen natural areas would be subject to varied land uses, some of which could be intensive. The disposition of the boundary line could therefore be an important function in preserving the wilderness quality of the study area.

TABLE B-2 Number of natural areas by class in the study area that would be contained within the designated floodway distict, and the number that would be partly in the floodway district and in another area with a different land use policy.

NATURAL AREA CLASS	NUMBER IN TOTAL STUDY AREA	NUMBER THAT WOULD BE CONTAINED IN THE FLOODWAY DISTRICT	NUMBER IN MORE THAN ONE LAND USE DISTRICT
1	1	0	1
2	9	2	7
3	11	7	4
4	5	1	4
5	5	5	0
TOTAL	31	15	16

In addition to the effects of land uses and natural area dissection as a result of the floodway district scheme, part of the vegetation in the zone will be removed to increase hydraulic efficiency. This action, depending upon the degree of application at a particular site, could have severe detrimental impact on natural areas.

Numerous references to selective removal of vegetation in the floodway and flood plain districts, exist. The following statements related to selective removal of vegetation have been extracted from three documents: "The City of Calgary Flood Study", Volume 1, "Bow River Report, City of Calgary Flood Study", Appendix, and the "Bowness Flood Study". Although the latter report is not specifically under question here, it was the report in which the concepts of floodway and flood plain district were first introduced. Therefore, it contains more specific references to some of the flood management measures, than the former documents mentioned.

The statements which refer specifically to vegetation removal are as follows:

> "At the same time, however, it should be noted that there is much volunteer growth on the river banks and gravel bars. This growth should be removed to improve the hydraulic efficiency of the river without significant detrimental effect on aesthetic or environmental values."

> "Clearly, wholesale removal of trees and bushes cannot be undertaken and, in fact, is not necessary. The character of the area should be preserved by selective removal only."

> "In the flood plain as a whole, dead trees and scrub should be removed. In the tentatively recommended 'floodway' district, (as outlined in '4.1 - Statutory Regulations') which takes in parts of the river banks, brush and small trees should be removed as well. Large, healthy trees, say over twenty feet high, should remain. In this way, the aesthetic qualities of the area can be preserved."

The first statement is somewhat ambiguous. Volunteer growth is not defined. Presumably any vegetation not specifically planted by man could be called "volunteer". Other than in a few areas, this pertains to virtually all the vegetation on the river flats. How far back from the river "volunteer growth on the river bank" goes, is not stated. In this passage, no mention is made of the kind of vegetational clearing required with respect to plant community composition.

References to vegetation removal in the Bow River Flood Study Appendix, are of a general nature. Several graphic cross-sections which indicate the general approach to selective removal of vegetation are displayed. Because of their hypothetical nature, however, if is not possible to react to them.

In the discussion of the Bowness reach of the study area (from the "Bowness Flood Study"), more specific, although somewhat contradictory statements are made. On one hand the report recommends that "wholesale removal of trees and bushes cannot be undertaken and, in fact, is not necessary". On the other hand it states that dead trees and scrub should be removed from the flood plain as whole, and in addition to this, in the floodway district, brush and trees under twenty feet are also to be removed. There appears to be no way to reconcile these two statements. If the first statement is accepted, then sanctity of many of the city's "best" natural areas will be preserved. If subsequent statements are accepted, then virtually none of the city's natural areas will be preserved.

Implicated in the statement advocating the removal of all trees under twenty feet, is removal of all replacement stock for any of the forested vegetational communities. As mature trees died off, the communities would eventually be managed as open vegetational types, thereby leading to a major change in the aesthetics and in the wildlife capability of the area.

The impact of selectively removing vegetation as part of the flood management plan could range from totally devastating to negligible, depending on how the propositions of the plan are interpreted. Regardless of definitive reference for this action, some possible effects can be generalized. These are summarized below:

(a) By simplifying the vegetation community through removing underbrush, etc., cover and feeding niches valuable to wildlife are eliminated. This results in a reduction in the number of species of wildlife using the area.

(b) In general terms, removal of dead and decaying vegetation prevents nutrients from returning to the soil and thus lowers the fertility and productivity of that community.

(c) Dead and decaying trees provide nesting sites for certain species of birds and feeding areas for all forms of wildlife. Decaying trees are utilized extensively by insects; these in turn provide food for higher animal forms.

(d) Overhanging willow vegetation along the river's edge provides hiding and nesting cover for a wide variety of birds. This cover is essential to some species of waterfowl, when young are newly hatched.

(e) The root networks of all plants bind or hold the soil. The root systems of taller plant species such as shrubs and trees, are deeper and more extensive than forbs and grasses and thus have greater soil holding capability. The removal of these vegetation types results in greater erosion and soil instability.

(f) The general importance of dense vegetation in urban areas is well known. Vegetation buffers sound, absorbs pollutants and modifies temperature. These benefits will be lost to a degree that relates to the amount of and kind of vegetation removed.

3. THE FLOOD PLAIN DISTRICT

Recommended land uses within the designated flood plain district are all intensive and therefore offer little or no pro-

tection for natural areas. Assuming that such land uses will occur, then the impact would be a major disruption of the riverine ecosystem resulting in aesthetic, wildlife, and recreational value losses. Of the 21 best natural areas (Classes "1", "2" and "3"), parts of 12 (See Map 5 and Table B-2), of them could be subject to this kind of devastation. The remaining parts are retained within the jurisdiction of the floodway district where they could be preserved. The question arises again, however, that a reduction, in part, may challenge the viability of the remaining portion to sustain itself in a quality state. If preservation of a wild quality in the area is required, then adjustment to land use boundaries, or some other provision to sanctify natural areas, may be the solution.

4. THE ENGINEERING WORKS

(a) Effect on the Biology of the Bow River

The overall plan involving engineering works in the Bow River, trends towards channelization of the stream. Obstructions such as islands, bars, shoals, and obsolete abutments, piers, etc., would be removed. The channel would be widened in some places and dyked in others. In some instances, these actions are designated with respect to site and an impact reaction comment has been provided accordingly. Some of the proposed action, however, is not specifically site related but is identified for application through the area in general.

Some of the physical features which currently contribute to the status of the fisheries habitat will be destroyed. In the channel widening processes a number of bank side gravel bars and shoal areas will be removed (e.g., sites A, E, F, G, H, I, J, K, and L in Map 5). The loss of these features, as well as the unspecified ones, could result in the loss of both actual and potential spawning areas, food production grounds and backwater areas. A number of mid-channel gravel and sand bars are slated for removal. Some are specified as individuals or as complexes such as at sites C, D, and M in Map 5. Some are not site identified. These bars could serve as spawning substrate as well as contributing to pool-riffle complex of the stream. Their loss will add to the decline in fisheries capability. The general processes of "channelization" will tend to smooth out the habitat by reducing the incidence of areas of turbulence and quiet water, which overall enhance the habitat. The resultant effect will be to reduce fisheries capability and ostensibly will result in fewer game fish within the study area.

No signifant changes are anticipated in the river temperature regime nor in the normal water chemistry as a result of

the engineering works. A temporary increase in the sediment load may be expected during the implementation of channel modifications. The capacity of the river to move the sediment load will remain and the materials will generally be carried away to be deposited elsewhere. The advent of new sediments should cease when substrate disturbance ceases.

The new channel configuration will produce a new pattern of currents. Bottom and suspended materials will thus be subject to deposition in new locations within the river. Some existing spawning and food producing areas could thereby be smothered with sediments thus contributing to a reduction of fisheries capability. By the same token new areas could be created but it is moot whether or not they would serve the biological function that would otherwise be lost.

A quantified appreciation of the reduction in fisheries capability is difficult to obtain. There is no site by site inventory of physical features and their relative values to the fishery through the study area. It is generally understood that these features in total make up the conditions which account substantially for the quality of the fishery. Reductions in this quality will occur but the degree cannot be specified using the information base that is presently available.

(b) Affect on the Terrestrial Biological System

Most of the engineering works as they affect the terrestrial orientated biological systems relate to the removal of small amounts of bank side vegetation, of some areas of stream bank habitat and of some sand and gravel bars (along with their attendant vegetation cover). Although small amounts of natural vegetation are considered less important than natural areas the steady removal of them tends to simplify the ecosystem thus depreciating its existing quality. The existing streambank functions as specific habitat critical to some wildlife such as amphibians, birds and mammals. A reduction in the amount of this habitat will reduce the capability for these animals. A number of gravel bars and small islands are slated for removal or for vegetation clearing. Many of these features are isolated from human disturbance and as such provide protected resting and nesting areas for birds. Without this habitat or the vegetation cover numerous species of birds undoubtedly would not inhabit the city.

Some comments identifying anticipated impacts at designated sites and in reaction to specified engineering works are following:

Bowness Area. Most of the engineering works slated for this area have been completed. An impact evaluation of these works is therefore out of context.

Bow View Nursing Home Region. Dyking in this region would not have a significant impact on the natural terrestrial environment. This area is already highly disturbed and the vegetation is for the most part, exotic.

Crowchild Bridge Region. Channeling in this area would result in the removal of significant amounts of natural vegetation (mature balsam poplar and willow) Generally, all such areas can be considered valuable. In comparison to other natural areas along the Bow River, this area was not rated very highly. This is primarily because the area does not contain a high diversity of cover types.

Langevin Bridge Region. The north side of this section contains certain elements of "natural" vegetation, principally balsam poplar with exotic vegetation understory, which would be removed. This area, however, was of insufficient size to be classified as a "natural area". In addition, it contains considerable exotic vegetation elements.

The south side of the Bow from Langevin to the Elbow, does not contain any significant areas of natural vegetation. Therefore, the impact on the natural environment in this area cannot be considered significant.

Prince's Island. The dyking along with channeling in this area would result in the removal of nearly all the remaining "natural" vegetative elements in this area. Vegetation to be removed consists of primarily mixed balsam poplar and willows (tall and short willows).

Considering Prince's Island as a whole, it was thought to have insufficient natural vegetative cover to be classed as a "natural area". However, the majority of natural vegetation and wildlife species which are found in this area, are associated with those parts of the island which are to be removed.

St. George's Island Area. Generally, the channel and dyking alternations to be carried out on the south bank of the river opposite St. George's Island, involve the removal of fill materials. The majority of this area presently serves as a parking lot. North of the parking lot the past overstory of mature balsam poplar has already been removed and thus the natural value of this area has been depreciated. A thin perimeter of natural shrub vegetation (principally red-osier dogwood) does exist along the river's edge as well as willow covered gravel bar. Farther east, opposite the tip of St. George's Island, a narrow stand of balsam poplar is also slated to be removed. Although this area does contain natural vegetation elements, these are of insufficient quantity or quality, to warrant the designation this site as a natural area.

The eastern tip of St. George's Island has also been altered and its natural value lowered, by the implementation of recommended flood control engineering measures. However, the fact that this area has been protected from overuse by the Zoo has meant that its natural character has survived. The presence of key wildlife species in this area is an indication of this fact. Therefore, past and possibly future engineering activities in this area may have had and can be expected to have, a relatively high impact on this area in comparison to other areas where dyking and channel operations are anticipated.

Cushing Bridge Area. The impact of channel improvements east of the Cushing Bridge on the north and south sides of the River would appear to have a negligible impact. A few mature balsam poplars would be removed on the south bank along with a thin perimeter of shrubs. On the north bank, the area is highly disturbed (dominant vegetation appears to be exotic weeds). On the north side of the river, west of the Cushing Bridge, a narrow portion of natural area would be removed.

C. DISCUSSION AND RECOMMENDATIONS

A presumed predication for evaluating the impact of the proposed flood management plan is that the plants, animals and fish are of value to the City of Calgary and the people of Alberta, and, that there should be some measure of how this value will be affected. It is further presumed that the effects would be appraised relative to all needs and weighed against the advantages or disadvantages of implementing a flood control plan for the sole purpose of property protection. The flood management plan will reduce the quality of the natural systems. There would be a significant depreciation in conditions that otherwise comprise a base for 'wilderness' in an urban setting along with attendant recreational uses and aesthetic appreciation. A judgement therefore is required on the significance of this loss and whether or not it can be reconciled with advantages gained elsewhere by incurring the loss. At the same time there is the opportunity to reduce these losses through modifying the flood plan and by mitigating some of the unavoidable losses. These ameliorative measures are presented in the following recommendations:

1. Re-establish the boundary delineation of the Floodway zone so that select natural areas can be included in its jurisdiction thereby affording them increased chances of preservation. (This action would not be necessary if the city were to afford these areas special protection.) Class 1, 2 and 3 "natural areas" have the highest relative values and they at least should be protected.

2. In all cases keep vegetation removal down to an absolute minimum.

3. Re-examine the need to remove shrubs and trees under 20 feet in height in the Floodway District and shrubs and dead trees in the Flood Plain District.

4. Mitigate for vegetational and habitat losses through landscaping-intact sites with the objective of either upgrading them or managing them to replicate habitats that are lost.

5. Keep all proposed physical disturbance and disruption of the river channel at a minimum.

6. Consider the use of abandoned flooded gravel pits in the river flats as managed put-and-take sport fisheries. This measure could partly mitigate the anticipated loss in the sport fishery of the Bow River.

7. Examine the relationship between Flood Plain natural areas and natural areas beyond the Flood Plain prior to the ultimate determination of natural area boundaries.

8. Prior to implementing future engineering measures, a supervisory body of natural scientists should be established. The role of this body would be to ensure that the impact would be minimized during the construction phase through adherence to environmental protection specifications.

nd

class 1
2
3
4
5

best

poorest

PART 4. PUBLIC PARTICIPATION AND RESPONSE

A. PURPOSE OF PUBLIC INVOLVEMENT

B. METHODOLOGY

1. Contact
2. Advertising
3. Study and Film

C. LEVEL OF PUBLIC PARTICIPATION TO DATE: PROBLEMS ENCOUNTERED

D. PUBLIC RESPONSE TO DATE

1. Attitude to Flooding
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4. Credibility of the Report
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PUBLIC PARTICIPATION AND RESPONSE

PART 4

PUBLIC PARTICIPATION AND RESPONSE

This part deals with a discussion of public participation in this study and the public response to date. Public participation and response will continue as a result of the release of this study culminating initially in public hearings set for October.

A. PURPOSE OF PUBLIC INVOLVEMENT

One of the explicit aims of this study was to encourage public participation. This was stated in the two news releases given jointly by the Honourable W. V. Yurko, Minister of the Department of Environment, Alberta, and His Worship R. Sykes, Mayor of Calgary, on June 7 and June 27, respectively: "A major element of the study will be to encourage the involvement and participation of citizens directly and indirectly affected by the Montreal Engineering Report's proposals in order that their concerns are known prior to action".

It was thus the hope of the two governments that the public would be aware of what was proposed for the river and would have the opportunity of voicing their opinions on the recommendations prior to public hearings.

Such an aim is also expressed within the Bow River Report. As one of their four major recommendations, Montreal Engineering stated the need "to gain public acceptance of the measures which have been recommended and give the Province and the City a clear mandate to proceed with their implementation". (Bow River Report, 1973: viii).

Consequently, it is the aim in this section to articulate as clearly as possible, those public responses which have been forthcoming to date.

B. METHODOLOGY

Initial and ongoing contact with the interested public was attempted in a series of ways.

1. CONTACT

(a) Contact with the public was initiated following the compilation of a contact list. The list consisted of individuals, community associations, special interest groups, companies and professional associations, who may be affected directly or indirectly by the implementation of the proposed recommendations of the Montreal Engineering Report. This list was compiled in conjunction with a representative from the Alberta Department of Environments Calgary office.

(b) Contact with these people was undertaken through a combination of telephone calls made by the Department of Environment and members of Lombard North and the mailing of a covering letter. When personal contact was made, interested parties were given a cursory overview of the study, its proposals, and how it might affect the area with which they were concerned. They were also provided with the opportunity to become more involved.

(c) Those people and groups who responded to this letter were then offered copies of the Bow River Report and/or a slide presentation. The presentation attempted to acquaint the people with the general character of the river, and to identify those areas which would be affected by a flood and by the flood study recommendations.

(d) Requests were made following presentations for a continued involvement of interested individuals and groups.

(e) Monies were set aside by Lombard North to assist members of the respective communities and groups actively involved in an assessment of the potential impact of the Bow River Flood Recommendations.

2. ADVERTISING

In conjunction with the above steps, various modes of advertising were utilized. Following the release of the study to the public, and the first news release of June 7, 1973, Calgary's two newspapers were approached in an effort to secure coverage of the study. As no response was received at this time, another attempt was made with a second news release on June 27. At this time, all media were approached. Other than one article and an editorial comment in each of the newspapers, and a statement from radio and T.V. stations announcing the study, response was negligible. A two minute time slot, however, was secured on C.B.R.'s Eyeopener, in which Mr. McKay of Lombard North outlined the possible impacts of the implementation of the Bow River Flood Study Recommendations.

Concurrent with the second news release, a private advertising outfit was retained to distribute the remainder of the covering letters to all residents in the designated floodway/flood plain districts, outlining the purpose of the study.

Lombard North's summary of the Bow River Report was completed in the latter part of July. This was printed in news book form and was available for distribution in the first week of August.

In conjunction with this summary, a flier was also produced. It consisted of:

(a) A map, identical to the one within the comic, depicting various communities, landmarks, and an identification of the flood plain area along the Bow River within the City limits.

(b) An introduction to the Bow River Report, outlining its basic recommendations, and a statement about the study being conducted by the Bow River Study Committee. This flier was in turn enlarged, and produced in poster format, containing the same information as described above.

In the latter part of July, and intermittently throughout August, two students were retained to distribute summaries and fliers within the designated flood plain throughout the city. Also during this time, the students carried out "spot drops" throughout the city. These spot drops essentially consisted of putting up posters in prominent locations.

This canvassing was followed further in the end of August, by students of the Vocational and Rehabilitation Research Institute, who distributed both fliers and summaries to dwellings situated within the flood plain area.

In additon, the above printed material was given to the Federation of Communities office. The material in this instance was used for a "mailout" to various community executive councils throughout the city and to interested individuals who frequented the Federation's offices.

The Inglewood-Ramsay Community Association also received this material throughout the study for internal distribution upon their request.

During all contacts, whether written or verbal, people were made aware of places where they could receive further information. These places included the Lombard North Group office, Department of Environment office, the City Engineering Department, and city's public library and its branches. For specific information, people were asked to direct their questions to the Lombard North Group.

3. STUDY AND FILM

Further information will be provided the public with the release of this report and subsequent film. This report will provide the public with a framework in which they may assess the Flood Study's recommendations upon their areas of interest.

The film provides an outline of the study. It identifies the character of the Bow River, the problems and recommendations of the Bow River Flood Study, and the manner in which these problems and recommendations are assessed by the public.

C. LEVEL OF PUBLIC PARTICIPATION TO DATE: PROBLEMS ENCOUNTERED

Contact with the public met with varied success throughout the study. The prime reason for this may be attributed to the fact that it was conducted through the summer months. Many of the interest groups and community associations had gone into a state of dormancy, or disbanded temporarily due to members leaving for summer vactions.

This was further compounded by the fact that the Bow River Report and subsequently Lombard North's summary were not released publically until the latter part of June and the early part of July. Thus, when initial contact was made in late May and early June, only a limited amount of information could be made available (i.e. Lombard North's slide presentation of the river and the objectives of the study).

This factor caused many people to view the study with skepticism, for they could not understand how they could become involved in a study which did not furnish the necessary information required for comment.

The attitude of the media also posed a problem throughout the study. It was thought rather naively at the beginning of the study that such a topic as flood control, as described within the report, would be readily picked up by the media. This, however, was not the case. With the exception of articles written in The Calgary Herald and The Albertan upon release of the report, and a statement announcing the study on T.V. and radio newsbroadcasts, the report was largely ignored. It was described by a number of television and radio news broadcasters as not being "controversial enough". One reporter did, however, cover the July 4th meeting of the Bowness Community Association and provided the study with the only media coverage to date of public reaction to the report. (Another reporter from The Calgary Herald, is at present compiling a story about the study. Thus far, he has interviewed members of the Inglewood and Bowness Community Associations, Mr. D. Nancarrow of Montreal Engineering, and members of Lombard North. The publication date for this article has yet to be determined, but it is to be printed prior to public hearings).

Participation by the public throughout the study, was restricted to a number of communities situated immediately alongside of the river - namely, Bowness-Montgomery, Spruce Cliff, Sunnyside-Hillhurst, Sien Lok Society of Chinatown, Inglewood-Ramsay, and Ogden. There was some response from interested individuals who inquired about the study having seen the advertisements within the two city newspapers. For a list of those individuals and groups contacted, refer to the list provided in the appendix.

Contact with the above communities was not indicative of community participation "per se". Rather, it was largely restricted to the executive councils of Sunnyside-Hillhurst, Sien Lok Society, Ogden, the Redevelopment Committee of Inglewood-Ramsay, and the Planning Task Force of Bowness. Such a restricted degree of contact was not the intention of Lombard North. It was the result rather of the organization of the individual communities and the small number of interested peoples in each area.

Lombard North had set aside, within their budget, a sum of money for the reimbursement of individuals who became involved in the study, on a community level. It was the intention to reimburse only those people residing within the respective areas being studied. This was to insure the highest amount of community participation as possible.

However, Bowness and Inglewood were the only two communities which took advantage of this money. This money was then utilized according to stipulations agreed upon between Lombard North and respective communities. The two major stipulations were:

1. That the money be used to reimburse indigenous people of each community for their time; and,

2. the people involved should act as liaisons between Lombard North and the community at large, directing information and questions between each.

In Bowness, the community association decided to let the Planning Task Force handle this job. Consisting of five members, this committee did not change its members through the duration of the study. It also appears that the members sitting on this committee were, for the most part, residents of Bow Crescent.

The Inglewood Commmunity Association decided that the Inglewood Redevelopment Committee should be responsible for the involvement of its members in the study. This committee set up an information distribution centre on 9th avenue, southeast. Residents within the area were asked for their participation in disseminating and collecting information for the study. As a large number of people did volunteer, there was a constant turnover of people working on the projects.

Near the end of August, there was an indication that Sunnyside-Hillhurst was organizing a study group to consider the ramifications of the Montreal Engineering Study upon their community. Up until this time, the community had been involved with the issue of the city's proposed development of transportation corridors through their area.

A number of special interest groups and individual were also approached throughout the study. However, with the exception of a few individuals who asked for further information for their own use, the people and groups declined comment. Their reasoning was that the Montreal Engineering Study was too complicated for them to comment upon, or that they would not be affected by either a flood or the flood study's recommendations.

D. RESPONSE TO DATE

1. ATTITUDE TO FLOODING

During the meetings with interested people throughout the study, it appeared that few people really accepted the fact that summer flooding could pose a serious and possibly dangerous problem in the future. This is similar to Dr. Burton's findings in the Montreal Engineering study of the Bowness reach of the river, completed in 1971. At that time Burton found that there was little concern shown by the people interviewed for future flooding. People do not appear to believe that it can happen while they are residing in the flood plain area. Or if they do accept the possibility of flooding, it is with the attitude that they will worry about it when it actually occurs.

2. PERCEPTION OF THE RIVER

Reaction to the Bow River Flood Study was mixed. It appeared that there was some correlation between proximity to the river and degree of interest with the Montreal Engineering Study; the farther away an individual's or group's physical concerns were situated, the less the interest expressed. For the city as a whole, it was our feeling that many people don't care about the river. It is just some natural feature that happens to exist within the city area.

Such an attitude is evidenced by the way in which the public land immediately bordering the river has been ignored and has been permitted by the public at large, with the exception of some special interest groups, to be ignored. The amount of garbage found within and alongside the river throughout the city, further attests to this lack of concern.

However, the groups and individuals who had some vested interest within the flood plain area, expressed a great deal of interest for the river and any development related with it. As noted above there was a tendency by many of these people to not accept the probability of future flooding with much concern.

They did recognize that serious damage had been incurred by both summer and winter flooding in the past. They also accepted the fact that flooding of a serious nature could occur again during the summer months. However, their acceptance of this fact was based on the grounds that such an occurrence would have an extremely low probability.

In conjunction with this low perception of possible future hazard, there were a number of concerns raised by these people both for the report itself and the subsequent ramifications of it.

3. COMPREHENSIVENESS OF THE REPORT

The majority of the groups who were actively involved, felt that the Bow River Report was too narrow in its scope of study. Although they appreciated the fact that Montreal Engineering's terms of reference were confined to a flood study, they felt that the ramifications which arose from it should be considered as well.

Such a feeling was strongly evident in the communities of Hillhurst-Sunnyside and Inglewood. The former community, felt that the Bow River Flood Study, with its recommendation of replacement of the existing Louise Bridge, could be used by the city as a lever by which it could implement the development of expanded traffic arteries through their area. Inglewood-Ramsay also expressed grave concern for the ramifications that the Flood Study's recommendations could possibly have upon the acquiring of their N.I.P. (Neighbourhood Improvement Programme) grant and for the actual implementation of their city approved design brief.

4. CREDIBILITY OF THE REPORT

The establishment of the maximum flood level in the Bow River Flood Study was treated with some skepticism. It was the thought of many of the residents of the riverside communities that Montreal Engineering was guilty of "over design".

This skepticism arose from two factors. First, it was thought that the statistical models utilized by Montreal Engineering in computing their hydrological data, were used out of context. Secondly, many people could not understand how Montreal Engineering could state

that a flood, the exact extent of that experienced in 1897, could reoccur. Such reoccurrance, they claimed, would be prohibited by the dams, (i.e. Ghost, the Bearspaw) which now exist upstream from Calgary, which were not present in 1897. These dams, if managed with effective capability during periods of high water, could partially alleviate some of the potential damage of flooding in Calgary.

Furthermore, these people mentioned that study of the 1897 flood had indicated that there had been extensive burn-off of ground cover in the Bow River Watershed during the time of that flood. As this ground cover has been since restored, it would now offer some retention and subsequent slowing down of run-off in the foothill area of the watershed. Consequently, less water in a short period of time, would be permitted to swell the Bow River and its tributaries.

5. ALTERNATIVES

Further cirticism was directed at the report for its lack of fully detailed alternatives to the land management scheme of flood control. It was the thought of many people that they should be presented with a number of well laid out alternatives; for if the flood control scheme is to save them from danger, they should have a right in saying how they would like to be saved.

In addition to this criticism, they offered two alternatives:

(a) Insurance: Essentially a negative approach, for it accepts' that there is going to be a flood. This alternative would be compulsory for everyone within the designated flood plain. The residents would have to pay a premium for the financial protection of their goods from flood damage. Such a programme similar' to that now in effect in the United States through H.U.D. would be based upon government subsidy of private insurance companies.

(b) Dam: It was also suggested that one large dam be built upstream from Calgary. The cost of this structure and the cost of cleaning up around the area after its construction, was thought by many not to be a prohibitive factor, if it was compared to the property damage and social costs that would be incurred throughout the city after a flood of 80,000/110,000 cfs. Such a cost benefit analysis should people thought, be done in more comprehensive terms, than the one conducted by Montreal Engineering, when they did review this scheme as a possibility (i.e. more emphasis given to social factors).

6. AESTHETICS OF THE RIVER

Concern was expressed by all the riverside communities contacted about how the implementation of the proposed recommendations would affect the natural beauty of the river. These communities felt that the city had done a poor job to date in maintaining the public river land in an acceptable manner, and were concerned about how the minor engineering works suggested within the report, would be landscaped.

In Bowness, much criticism was pointed at the city for their failure to do something with Crematorium Hill. Inglewood was also critical of the city's inability to do something with the river-bank area between 14th Street, Southeast and Cushing Bridge.

7. MAINTENANCE COSTS

The point was also raised that little, if any, concern was given to the maintenance cost of the engineering works recommended. The communities felt that there was an implication within the report that once engineering works were completed, no further work was required. Such an implication they felt, ignored the river's tendency to continually modify its channel. In conjunction with this, they raised the question of why should they, as citizens, be responsible for the financial upkeep of a project that they did not demand in the first place. The attitude of some was that they may as well maintain a state of preparation for a nuclear holecaust, which has the same chance of occurring as a flood.

8. PUBLIC VERSUS PRIVATE ACCESS

Concern was also raised that the implementation of the flood plain recommendations could also seriously affect private access and enjoyment of the river. Older communities, such as Inglewood and Bowness, where the lot lines incorporate the river's edge, are fearful that the report will somehow, if implemented, affect their private access to the river. Residents in both communities have stated emphatically that they will not permit part of their lots to be used publically. They moved to their particular lots with the intention of enjoying the river for themselves.

The question has also been raised here as to who will own the land, should there be some additional material for purposes of bank stabilization added to an individual's yard. Will this remain within the owner's title, or will the government acquire title to it. And if the latter, which government - city or provincial? And further in this line of questioning, will such an action set a precedent for similar waterfront lots throughout Alberta?

Unfortunately, we have not been able to answer this question within our part of the study. Such an answer, according to lawyers contacted, will have to be found within specific court cases.

Spruce Cliff, Hillhurst/Sunnyside, and Ogden, on the other hand, are very concerned about public access to the river. Areas such as Lowery Gardens, the island immediately west of the Crowchild Bridge (a foundation of an old transmission tower presently characterizes the island), city land bordering the river along Memorial Drive, including the riverside of the dyke, and the area south of Glenmore Trail, should be developed, they feel, into public parkland, with good public access.

9. PROPERTY VALUES

The fear was further expressed that implementation of the flood plain recommendations could have a detrimental effect upon property values. The property within the flood plain could become stigmatized as an undesirable place in which to live. This would then lead to a decrease in property value.

Furthermore, the implementation of the recommendations, was seen by some people as a mode of "block-busting". The recommendations were perceived as merely being fronts for the city (in keeping with its public policy of acquiring riverfront lots), by which it could buy up existing riverbank property which is privately owned.

In conjunction with this, many people who reside on riverbank property, were concerned as to how rigidly the recommended suggestions of the Bow River Flood Study would be implemented by the city. The thought was expressed by these residents that their desire to add on to, or modify their existing dwelling structures, may be thwarted by the city's interpretation of the report. The city, in trying to exercise its policy of acquiring riverfront property, may make the obtaining of the necessary building permits difficult, or else impose such restrictions on future building, that the residents will not be able to afford the desired structural modifications.

THE APPENDIX

A. THE APPENDIX OF BIOLOGICAL INVENTORY

B. THE APPENDIX OF COMMUNITIES, ASSOCIATIONS AND INDIVIDUALS CONTACTED

THE APPENDIX

A

APPENDIX OF BIOLOGICAL INVENTORY

A. CHARACTER SUMMARY OF NATURAL AREAS

AREA 1

Cover Vegetation: Predominant cover type - balsam poplar. Less extensive cover types - mixed aspen/balsam poplar, balsam poplar/shrubs (black birch), meadow, and marsh. Forest understory vegetation - primarily grass and shrubs (red osier dogwood).

Disturbance: Area is generally in a natural state, but includes picnic shelter, picnic sites, and trail system.

Key Wildlife Species: No raptorine birds known to nest in the area, but habitat appears suitable. Kestrels observed in general vicinity.

AREA 2

Cover Vegetation: Predominant cover type - shrubs (primarily tall and short willow). Limited areas of balsam poplar. Several meadow and wet meadow regions.

Disturbance: Area dissected by railway. Slight evidence of informal recreational use.

Key Wildlife Species: Kestrels observed in vicinity, but are not known to nest here.

AREA 3

Cover Vegetation: Predominant cover type - balsam poplar. Others - grassland and shrubs (tall and short willows).

Disturbance: Little evidence of disturbance other than a minor trail.

Key Wildlife Species: None observed in area, but habitat appears suitable for kestrels.

AREA 4

Cover Vegetation: Fairly high degree of interspersion of cover types. Cover types - balsam poplar, grassland and shrub. Forest understory.

Disturbance: Small area in southeast corner barren of vegetation. Several trails. Fair degree of informal use.

Key Wildlife Species: None observed. Disturbance "may" prohibit their use of this area.

AREA 5

Cover Vegetation: Predominant cover type - mixed balsam poplar/grassland. Others - shrubs (tall and short willow, black birch), balsam poplar and wet meadow.

Disturbance: None

Key Wildlife Species: Kestrels and great horned owls observed in this area in past years.

AREA 6

Cover Vegetation: Predominant cover type - balsam poplar, understory - shrub (red osier dogwood). Other cover type - shrub (tall and short willow).

Disturbance: Active gravel mining. Several large ponds as result of past activity. Several roads. Two spits of land which formerly constricted the channel, have been removed.

Key Wildlife Species: Kestrels and great horned owls have nested consistently in this area in the past.

AREA 7 (Lowery Gardens)

Vegetation Cover: High diversity of cover types. Principle cover type - balsam poplar. Understory - red osier dogwood. Other cover types - shrub (tall and short willow), grassland, wet meadows, marshy areas.

Disturbance: Central portion of this area somewhat disturbed by recent land fill activities.

Key Wildlife Species: Kestrels and great horned owls have been known to nest in this area.

Note: The characteristics of this area have been described in some detail in the report entitled, "Five Natural Areas in the City of Calgary".

AREA 8

Vegetation Cover: Narrow strip of balsam poplar, some shrub growth (primarily short willow) at river's edge.

Disturbance: Area bounded on the south by car lot.

Key Wildlife Species: None recorded in this area.

AREA 9

Vegetation Cover: Balsam poplar and short willow co-dominant vegetation types. The latter is found close to the river.

Disturbance: Area bounded on the north by a parkway.

Key Wildlife Species: None known to utilize this area.

AREA 10

Vegetation Cover: Predominant cover types - young balsam poplar and short willows. Limited areas of mature balsam poplar.

Disturbance: One gravel road and numerous trails. The latter resulting from informal recreational use.

Key Wildlife Species: None observed to reside in this area.

AREA 11

Vegetational Cover: Predominant cover type - balsam poplar. Limited areas of shrub, principally willow. Forest understory - some shrub (red osier dogwood), exotic grasses. Areas of bare soil and gravel.

Disturbance: Campground has resulted in removal and disturbance of vegetation and numerous informal trails.

Key Wildlife Species: Kestrels have been known to nest in this area in the past. Their present status unknown.

AREA 12

Vegetation Cover: Predominant cover type - balsam poplar. Much of overstory removed. Red osier dogwood and willow (formerly understory vegetation) now overstory. Willow and young balsam poplar at tip of island. Forest understory - shrubs.

Disturbance: Removal of tall trees. Otherwise area has been preserved by its isolation.

Key Wildlife Species: Kestrels have nested in this area.

AREA 13

Vegetation Cover: Predominant cover type - mature balsam poplar. Tall and short willow at riverside. Forest understory - shrubs, primarily red osier dogwood.

Disturbance: Unknown.

Key Wildlife Species: Unknown - kestrels observed in area and habitat appears suitable for their use.

AREA 14 (Pearce Estate)

Vegetation Cover: High diversity of cover types. Predominant type - open balsam poplar and dense balsam poplar. Black birch and willow at river edge. Several meadow and shrub areas. Primary forest understory vegetation types - grass and shrubs (red osier dogwood and willows).

Disturbance: Understory vegetation disturbed by recreational uses. Areas closest to the river most natural.

Key Wildlife Species: Kestrels nest in this area.

Other: For detailed description, see Calgary Field Naturalists Bulletins.

AREA 15

Vegetation Cover: Isolated stands of mature balsam poplar, located along irrigation canal and close to the river. Tall and short willows, shrub growth follows edge of river and canal. Forest understory - mainly shrubs (dogwood, willow, black birch).

Disturbance: A considerable portion of this area has, in the past, been used for agricultural purposes. The area is also disrupted by numerous roads and trails.

Key Wildlife Species: No raptorine birds are known to nest in this area.

AREA 16 (Inglewood Bird Sanctuary)

Vegetation Cover: High diversity of cover types. Mixed balsam poplar/shrub, balsam poplar, grassland, shrub (dogwood, willow, black birch), wet meadow and marshy areas. Forest understory - shrubs (red osier dogwood, willow) and grass.

Disturbance: Area survives relatively undisturbed, primarily because of its protected status as a bird sanctuary.

Key Wildlife Species: Both kestrels and great horned owls are known to nest in this area.

Other: The importance of this area to a vast variety of bird species is well documented in the Bulletins of the Calgary Field Naturalist Society.

AREA 17

Vegetation Cover: Shrub (tall and short willow, black birch) balsam poplar and wet meadow.

Disturbance: The golf course, with respect to this remaining strip of natural vegetation, assumes the role of a protective buffer, rather than a disturbance.

Key Wildlife Species: No raptorine birds have been recorded nesting in this area, although kestrels have been observed in the general vicinity.

AREA 18

Vegetation Cover: Balsam poplar, tall willow, and wet meadows. Forest understory - primarily grass.

Disturbance: Despite close proximity to intensively used roads, area shows very little sign of disturbance.

Key Wildlife Species: A kestrel nest site was located.

AREA 19

Vegetation Cover: High diversity of cover types - balsam poplar, mixed balsam poplar/shrub (primarily black birch), grassland, and marsh. Forest understory - primarily grass, some red osier dogwood.

Disturbance: Area is dissected by several infrequently used roads. Natural vegetation generally intact.

Key Wildlife Species: Kestrels known to nest in this area. Red-tailed hawks have also been observed here.

AREA 20

Vegetation Cover: Balsam poplar, grassland, shrub (tall and short willow, black birch) and wet meadow.

Disturbance: This area is disrupted by numerous roads, pipelines and various activities. A number of areas of bare gravel are in evidence. There are also a large number of dead poplars in this area.

Key Wildlife Species: Although the habitat exists to support such species as kestrels, and great horned owls, disturbance probably prohibits their use of this area.

AREA 21

Vegetation Cover: Balsam poplar and shrub (tall and short willows).

Disturbance: This area has been preserved in a natural state because it is an island.

Key Wildlife Species: Has potential for a number of raptorine bird species, but information on use of this area was not obtained.

AREA 22

Vegetation Cover: Fair diversity and interspersion of cover types. Balsam poplar, grassland, shrub and limited marshy area.

Disturbance: Several minor roads. Gravel mining activity on northeast perimeter. Past haying in some grassland regions.

Key Wildlife Species: Kestrels known to nest here. Single great horned owl observed.

AREA 23

Vegetation Cover: Mature balsam poplar is dominant cover type. Band of tall willow along river edge. In backwater area, fairly substantial growths of sedge and rush.

Disturbance: None

Key Wildlife Species: Red-tailed hawk observed in area.

AREA 24

Vegetation Cover: Most extensive vegetation type - grassland. Others - mixed grassland/balsam poplar, balsam poplar and tall shrub (black birch). Forest understory - grass.

Disturbance: Evidence of some introduced grasses and clover in grassland vegetation type. Generally very little sign of disturbance.

Key Wildlife Species: Evidence of kestrels and red-tailed hawks inhabiting this area.

AREA 25

Vegetation Cover: High degree of interspersion of cover types. Predominant cover type - balsam poplar. Other types - grassland, shrub and several limited marshy regions.

Disturbance: Transected by a road and bordered on east by large gravel mining operation. No evidence of exotic vegetation and generally little evidence of disturbance.

Key Wildlife Species: Great horned owls known to have nested here in past years. Red-tailed hawks also observed in vicinity.

AREA 26

Vegetation Cover: High diversity and interspersion of cover types. Dominant cover types - balsam poplar and grassland. Other

cover types - shrubs (black birch, tall and short willow) mixed balsam/grassland and marshy areas. Small island at southern perimeter of area.

Disturbance: Punctuated by two gravel roads. Small area barren of vegetation.

Key Wildlife Species: Red-tailed hawks and great horned owls observed to reside in this area.

AREA 27

Vegetation Cover: High diversity and interspersion of cover vegetation types. Predominant cover type - grassland. Others - balsam poplar, mixed balsam poplar/grassland and shrub (tall and short willows plus small areas of black birch).

Disturbance: Minimal informal recreational use of the area.

Key Wildlife Species: Observed in the area - red-tailed hawks, Swainson's hawks, great horned owls, and kestrels.

AREA 28

Vegetation Cover: Dominant cover vegetation type - balsam poplar. Others - grassland plus minor areas of shrub growth along river (tall willow).

Disturbance: Some grazing in northwestern half of the area.

Key Wildlife Species: Red-tailed hawks recorded in the area.

AREA 29

Vegetation Cover: Dominant cover type - mixed balsam poplar/shrub. Other cover types - balsam poplar, wet meadow and shrub (primarily short willow).

Disturbance: None

Key Wildlife Species: Kestrels observed in area.

AREA 30

Vegetation Cover: Predominant cover type - grassland. Others - mixed balsam poplar/grassland, balsam poplar and shrub (willows).

Disturbance: Several very minor trails.

Key Wildlife Species: Red-tailed hawks observed.

AREA 31 (Fish Creek Vicinity)

Vegetation Cover: Predominant cover type - grassland. Others - balsam poplar, shrub (short willow and black birch). Balsam poplar understory - primarily red osier dogwood.

Disturbance: Several trails. Fairly intensive recreational use of the area.

Key Wildlife Species: Kestrels observed in area.

B. FLORA AND FAUNA SITED IN REPORT

Plants	Scientific Name
balsam poplar	Populus balsamifera
aspen poplar	Populus tremuloides
peach-leaf willow	Salix amygdaloides
pussy willow	Salix discolor
sandbar willow	Salix interior
yellow willow	Salix lutea
other willows	Salix brachycarpa
	Salix glauca
	Salix myrtillifolia
	Salix planifolia
black birch	Betula occidentalis
swamp birch	Betula pumila
river alder	Alnus tenufolia
red-osier dogwood	Cornus stolonifera

Animals	Scientific Name
Canada goose	Branta canadensis
mallard	Anas platyrhynchos
common merganser	Morgus merganser
red-tailed hawk	Buteo jamaicensis
Swainson's hawk	Buteo swaimsoni
kestrel (sparrow hawk)	Falco sparverius
great horned owl	Bubo virginianus
belted kingfisher	Megaceryle alcyon
yellow-shafted flicker	Colaptes auratus
Eastern kingbird	Tyrannus tyrannus
black-capped chickadee	Parus atricapillus
brown creeper	Certhia familiaris

B. FLORA AND FAUNA SITED IN REPORT (Continued)

Animals	Scientific Name
American robin	*Turdus migratorius*
red-winged blackbird	*Agelaius phoeniceus*
Baltimore oriole	*Icterus galbula*
rufous-sided towhee	*Pipilo erythrophthalmus*
beaver	*Castor canadensis*
porcupine	*Erethizon dorsatum*
coyote	*Canis latrans*
mule deer	*Odocoileus henionus*
Rainbow trout	*Salmo gairdneri*
Cutthroat trout	*Salmo clarki*
Mountain whitefish	*Prosopium williamsoni*

APPENDIX B

APPENDIX OF COMMUNITIES, ASSOCIATIONS AND INDIVIDUALS CONTACTED

COMMUNITIES CONTACTED

Bowness Community Association

West Bow Trail Co-ordinating Council

Spruce Cliff Community Association

Sunnyside-Hillhurst Community Association

Inglewood-Ramsay Community Association

Sien Lok Society

Federation of Calgary Communities
c/o Messrs. R. Potyok and D. Docherty

GROUPS CONTACTED

Alberta Wilderness Society

Bioscience Society
c/o Department of Biology
University of Calgary

Calgary Canoe Club
c/o Mr. H. Benthin, Director

Calgary Chamber of Commerce
National Parks Committee

Calgary Field Naturalists Society

Calgary Ski Club

Federation of Alberta Naturalists

Foothills Nordic Ski Club

Mayor's Pollution Study Group

National and Provincial Parks Association of Canada
Calgary - Banff Chapter

SPEC (Society for Pollution and Environmental Control)

Voice of Women

Alberta Fish and Game Association
c/o Mr. T. O'Keefe

Federation of Women's Leagues
c/o Ms. M. Betz

Company of Young Canadians
c/o Mr. B. Paston

Calgary Zoological Society
c/o Mr. R. Facey

Canadian Youth Hostel Association
c/o The President

BUSINESS GROUPS CONTACTED

Downtown Business Association

Calgary Real Estate Board
c/o Mr. F. Johns

Calgary Power Ltd.
c/o Mr. T. Schulte

Nu-West Development Corporation
c/o Mr. R. Scurfield

Burnco Industries Ltd.
c/o Mr. J. Burns

Imperial Oil Ltd.
c/o Mr. J. Hemstock

Western Irrigation District
c/o Mr. R. Slater

W. B. Jackson and Associates

Melton Real Estate Ltd. The Commercial Division

Skinner Management Co. Ltd.
c/o Mr. Skinner

Canadian National Railways
c/o Mr. R. A. Macdonald
Manager of Real Estate

Canadian Pacific Railway

P.A.R.D. Associates
c/o Mr. D. Diver

INDIVIDUALS CONTACTED

Prof. A. Comanor
Calgary, Northwest

Mr. Bob LeBlonde
Calgary, Northwest

Mr. & Mrs. G. Husband
Calgary, Northwest

Mr. Norman Morrison
Calgary, Southwest

Mr. A. J. Roberts
Calgary, Northwest

Mr. Dave Dyck
Calgary, Northwest

Mr. Owen and Mrs. Sharon Fahey
Calgary, Southwest

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BOW RIVER STUDY COMMITTEE

W. Solodzuk, Chairman, Province of Alberta
R. Bailey, Province of Alberta
E. Kupchanko, Province of Alberta
W. Perks, City of Calgary
H. Riley, City of Calgary
G. Steber, City of Calgary

DEPARTMENT OF THE ENVIRONMENT

H. Thiessen, Assistant Deputy Minister
F. Belyea, Executive Co-ordinator
D. Anderson, Community Worker

LOMBARD NORTH GROUP

R. Peiluck, Project Co-ordinator
J. Taylor, Project Co-ordinator
Dr. A. Fedoruk, Senior Biologist
D. Paterson, Senior Landscape Architect
E. Mustonen, Landscape Architect
D. Walters, Landscape Architect
B. Edwards, Terrestrial Biologist
J. Watton, Aquatic Biologist
B. McKay, Community Worker
M. Vaselenak, Community Worker
G. Willson, Community Worker